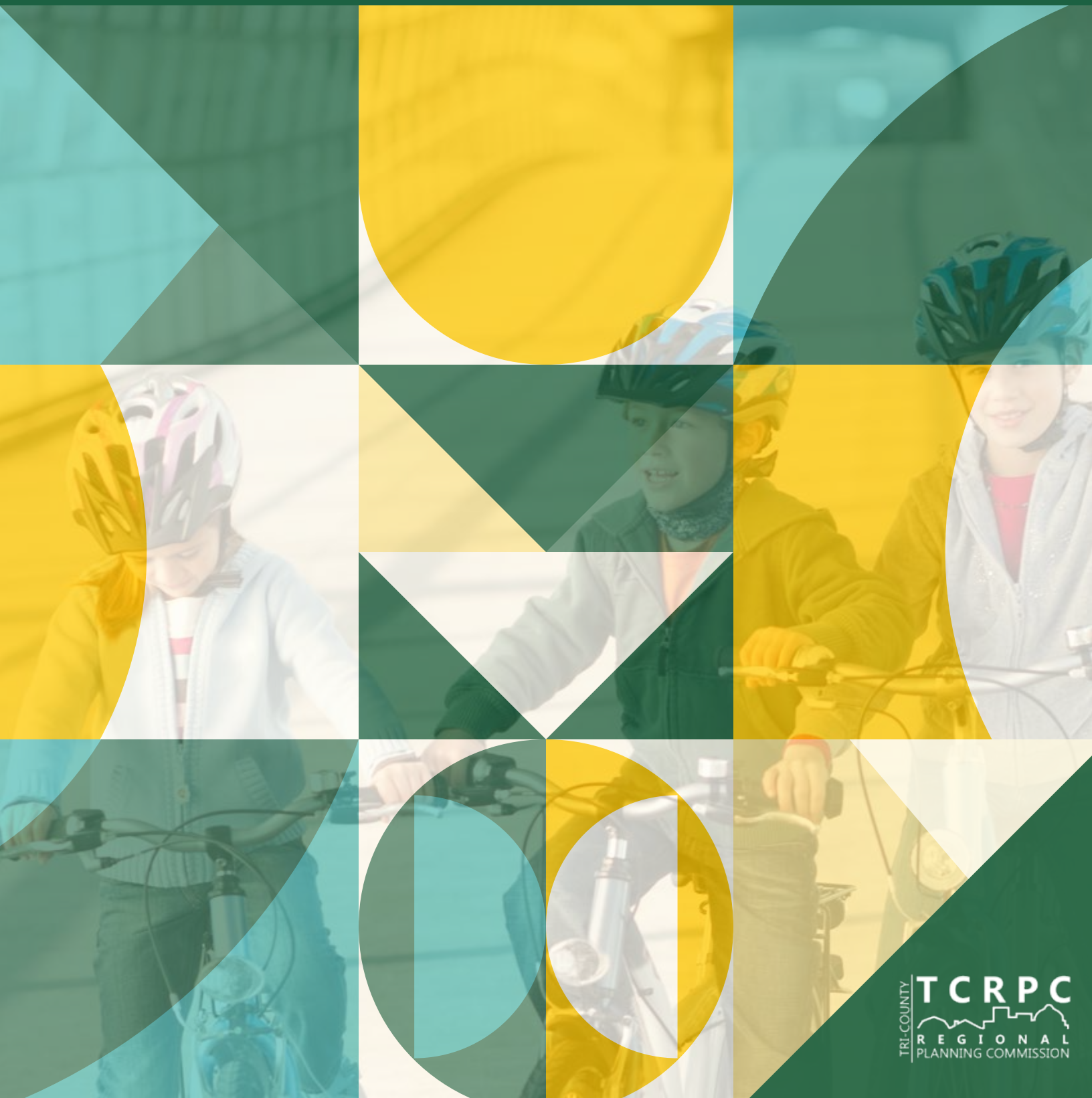
HARRISBURG AREA TRANSPORTATION STUDY

SAFETY ACTION PLAN

JULY 2024



TRI-COUNTY TCRPC REGIONAL PLANNING COMMISSION

Source: Dorret Oosterhoff, Kittelson

CONTENTS

EXECUTIVE SUMMARY

This summary provides page numbers for material required for self-certification under the Safe Streets and Roads for All federal grant program.

1. LEADERSHIP COMMITMENT AND GOAL SETTING

SS4A Certification Criterion	Page #
A high-ranking official and/or governing body in the jurisdiction publicly committed to an eventual goal of zero roadway fatalities and serious injuries.	5-6
The commitment includes either setting a target date to reach zero OR setting one or more targets to achieve significant declines in roadway fatalities and serious injuries by a specific date.	5-6

2. PLANNING STRUCTURE

SS4A Certification Criterion	Page #
To develop the Action Plan, was a committee, task force, implementation group, or similar body established and charged with the plan's development, implementation, and monitoring?	14

3. SAFETY ANALYSIS

SS4A Certification Criterion	Page #
Analysis of existing conditions and historical trends to provide a baseline level of crashes involving fatalities and serious injuries across a jurisdiction, locality, Tribe, or region.	22-23
Analysis of the location where there are crashes, the severity, as well as contributing factors and crash types.	24-50
Analysis of systemic and specific safety needs, as needed (e.g., high-risk road features or specific safety needs of relevant road users).	24-50
A geospatial identification (geographic or locational data using maps) of higher risk locations.	24-50

4. ENGAGEMENT AND COLLABORATION

SS4A Certification Criterion	Page #
Engagement with the public and relevant stakeholders, including the private sector and community.	13-18
Incorporation of information received from the engagement and collaboration into the plan.	Throughout
Coordination that included inter-and intra-governmental cooperation and collaboration, as appropriate.	13-18

5. EQUITY CONSIDERATIONS

SS4A Certification Criterion	Page #
Considerations of equity using inclusive and representative processes.	16-18
The identification of underserved communities through data.	16-18
Equity analysis developed in collaboration with appropriate partners, including population characteristics and initial equity impact assessments of proposed projects and strategies.	16-18

6. POLICY AND PROCESS CHANGES

SS4A Certification Criterion	Page #
The plan development included an assessment of current policies, plans, guidelines, and/or standards to identify opportunities to improve how processes prioritize safety.	8-9, 84-87
The plan discusses implementation through the adoption of revised or new policies, guidelines, and/or standards.	84-91

7. STRATEGY AND PROJECT SELECTIONS

SS4A Certification Criterion	Page #
Does the plan identify a comprehensive set of projects and strategies to address the safety problems in the Action Plan, with information about time ranges when projects and strategies will be deployed, and an explanation of project prioritization criteria?	51-91

8. PROGRESS AND TRANSPARENCY

SS4A Certification Criterion	Page #
A description of how progress will be measured over time that includes, at a minimum, outcome data.	89
The plan is posted publicly online.	https://www.tcrpc-pa.org/hats-safety

9. ACTION PLAN DATE

SS4A Certification Criterion	Page #
The action plan was finalized and/or last updated between 2019 and April 30, 2025.	Cover

Source: dfirecop/Wikimedia Commons

In the five years from the beginning of 2018 through the end of 2022, Tri-County roads saw:

274
deaths

1,177
suspected serious injuries

INTRODUCTION

Roadway deaths and serious injuries are on the rise across the country and the Tri-County Region encompassing Cumberland, Dauphin, and Perry counties in Pennsylvania is no exception. There were 274 deaths and 1,177 suspected serious injuries on Tri-County roads in the five years from the beginning of 2018 through the end of 2022.

In January 2020, the Harrisburg Area Transportation Study (HATS) Coordinating Committee adopted a motion to work toward reducing and ultimately eliminating fatal and serious injury crashes by 2045.

The Tri-County Regional Planning Commission (TCRPC), serving as the lead staff agency for HATS, was awarded a Safe Streets and Roads for All (SS4A) grant from the U.S. Department of Transportation (USDOT) to develop this regional safety action plan. By coordinating efforts across jurisdictions, the plan will enhance TCRPC's and HATS' ongoing safety and equity efforts with a focus on engagement and collaboration, strategy, and project selection.

This plan's content was developed with input from state, county, and local governments throughout the region.

Safe Streets and Roads for All (SS4A)

The Safe Streets and Roads for All (SS4A) program is a federal discretionary program with $5 billion in appropriated funds over five years from 2022-2026. Overseen by the Federal Highway Administration (FHWA), the program funds regional, local, and tribal initiatives through grants to prevent roadway deaths and serious injuries. SS4A supports USDOT's National Roadway Safety Strategy and the goal of zero roadway deaths using a Safe System approach. SS4A grants are available for safety planning, implementation, and demonstration activities.

About TCPRC and HATS

The Tri-County Regional Planning Commission (TCRPC) is the regional coordinating agency for economic growth, land management, transportation, and quality of life in Pennsylvania's Dauphin and Perry counties. It serves as the lead staff agency for the Harrisburg Area Transportation Study (HATS), the region's federally recognized metropolitan planning organization (MPO), which encompasses Cumberland County in addition to Dauphin and Perry counties.

Vision

The plan's vision is to eliminate fatal and serious injury crashes in the Tri-County Region by 2045 using USDOT's Safe System approach. A regionally led, evidence-based plan will chart the region's course toward that goal, establishing a cooperative foundation for successful planning and helping stakeholders more capably implement safety projects. Notably, the plan will position local jurisdictions with identified projects to be eligible for future SS4A capital project funding.

Goals

This plan seeks to reduce crashes and crash risk in the Tri-County Region by applying the principles of the Safe System approach.

GOAL 1

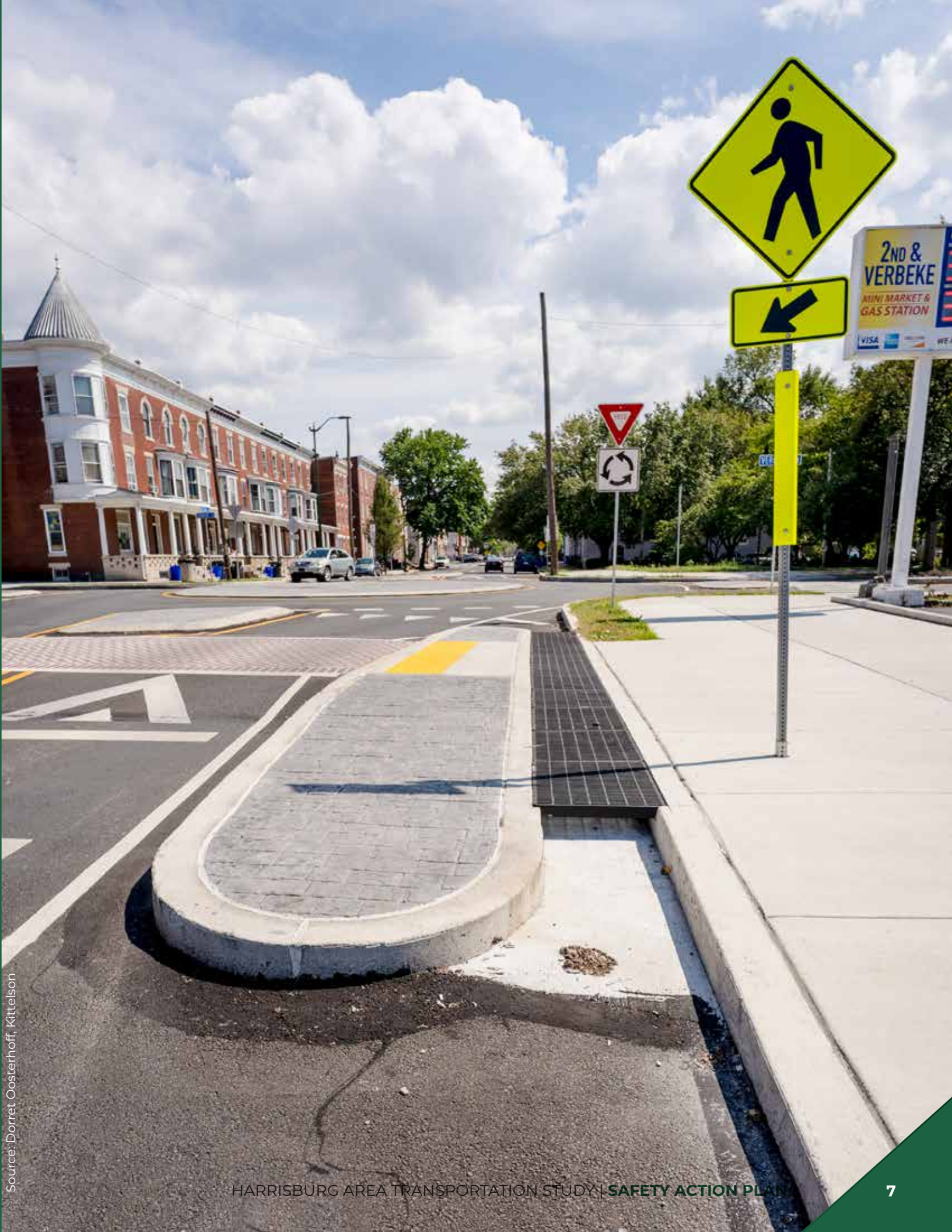
Use data-informed analysis and community needs to identify and prioritize opportunities to reduce fatal and serious injury crash risk for all road users.

1. Regularly analyze regional crash and risk patterns and trends to identify locations for safety improvements.
2. Implement proven safety countermeasures systemically to target locations with similar crash patterns and risks.
3. Implement spot-specific safety improvements at locations with higher and overlapping crash patterns and risks.
4. Undertake education and enforcement strategies to support engineering countermeasures and create a culture that promotes and prioritizes roadway safety.

GOAL 2

Strengthen partnerships with other agencies, organizations, and community groups to promote transportation safety.

1. Maintain a strong relationship with Pennsylvania Department of Transportation (PennDOT) District 8-0 to prioritize safety improvement funding in the Tri-County Region.
2. Convene the Safety Working Group regularly to monitor plan implementation, measure progress, and share information about applying the Safe System approach.
3. Collaborate with regional community groups to solicit input on planned engineering projects and targeted educational and enforcement strategies to promote roadway safety.
4. Encourage multidisciplinary partnerships in implementing engineering and non-engineering countermeasures and strategies.
5. Convene an annual safety summit.



Source: Dorret Oosterhoff, Kittelson

Previous Local Safety Efforts

This Safety Action Plan builds on previous and ongoing TCRPC initiatives, including TCRPC's Safety Dashboard. The dashboard is a web application that uses crash data from PennDOT's Pennsylvania Crash Information Tool.

In 2018, HATS and other area MPOs participated in developing the South Central Pennsylvania Environmental Justice Unified Process and Methodology Guide, which was adopted in 2019. HATS led the way in implementing the analysis identified in the study, which was eventually adopted across Pennsylvania and incorporated into environmental justice analysis for transportation improvement program (TIP) and long-range transportation plan (LRTP) development.

Since January 2020, when the HATS Coordinating Committee adopted its motion to work toward reducing and ultimately eliminating fatal and serious injury crashes by 2045, HATS has worked actively to establish a data-driven approach for network screening analysis. This safety analysis is being used to identify areas for low-cost systemic improvements and to prioritize projects for FHWA's Highway Safety Improvement Program (HSIP).

As part of the Safety Action Plan process, TCRPC formed an interdisciplinary Safety Working Group made up of agency staff from the region. The formation of the Safety Working Group helps further the cause of reducing roadway fatalities and injuries by providing a forum for local agencies throughout the region to discuss and coordinate. The Safety Working Group is described in greater detail in the "Planning Process" section.

Previous Statewide Safety Efforts

PennDOT has its own statewide safety efforts that are relevant to the Tri-County Region, three of which are described here.

In 2021, PennDOT produced a second edition of network screening locations for all 67 counties in Pennsylvania. Network screening identifies county-specific roadway segments and intersections that would benefit from safety improvements. Overlaps between the network screening locations and locations analyzed for this report are discussed in the "High Injury Network Overlaps with PennDOT Network Screening" section.

In 2022, PennDOT updated its Strategic Highway Safety Plan (SHSP) in collaboration with federal, state, and regional partners. A state's SHSP is a critical requirement for participating in the federal Highway Safety Improvement Program (HSIP). The HSIP provides funding for safety projects with the ultimate goal of reducing fatalities and serious injuries on public roads.

PennDOT also recently completed its Vulnerable Road User (VRU) Safety Assessment Report. This assessment is required under the federal Infrastructure Investment and Jobs Act (IIJA) and has been added to the 2022 SHSP as an appendix. The assessment developed a plan for improving pedestrian and cyclist safety through targeted and systemic improvements. The high-risk areas identified by the VRU Safety Assessment in the HATS area are noted as "Tier I" areas in the Existing Conditions section of this plan.

Safe System Approach

In January 2022, USDOT released its National Roadway Safety Strategy, which adopts the Safe System approach as its core.[1] Unlike traditional road safety practices that attempt to modify human behavior to prevent crashes, the Safe System approach focuses on modifying transportation system design to anticipate human errors and reduce crash severity to save lives.

Responsibility for safety must be shared by those who design and use the transportation system. In a Safe System, everyone works together, including road users, transportation system managers, law enforcement, emergency responders, and vehicle manufacturers.

The Safe System approach acknowledges that human bodies are vulnerable to impacts from motor vehicles. A transportation network designed and operated with human vulnerability in mind minimizes serious injuries and fatalities.

The term "Safe System" is singular because it promotes fostering an overall safe road system rather than addressing individual elements separately. There are three critical components of the Safe System: **"approach,"** **"principles,"** and **"elements."** These are illustrated in a simple graphic (**Figure 1**).

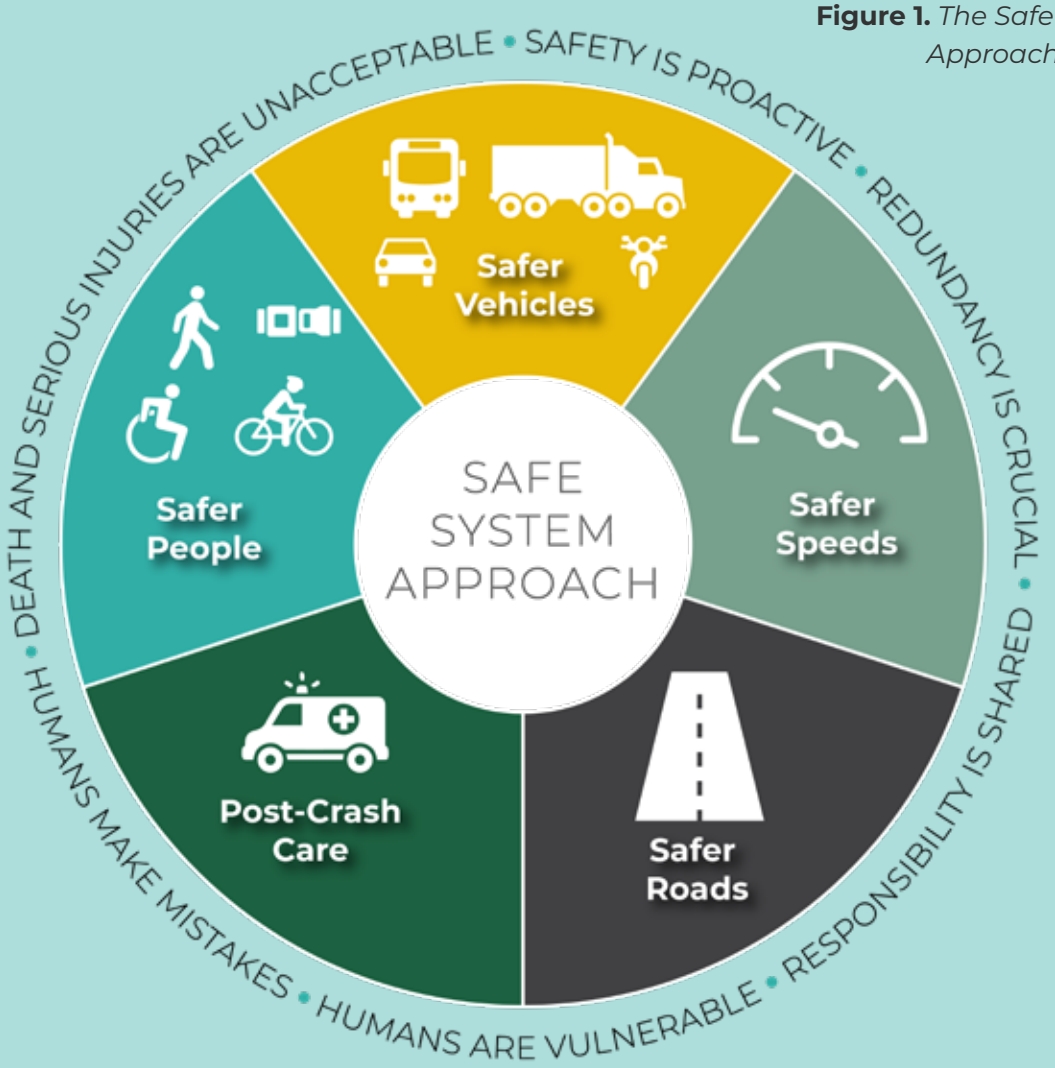
Transportation system managers using the Safe System approach work proactively, addressing safety concerns before crashes can happen. This is a departure from traditional road safety practices that address issues only after crashes occur.

The Safe System approach is driven by data. Crash data and roadway design characteristics are analyzed to identify patterns and trends associated with crash risk. Transportation system managers then systemically apply proven safety countermeasures at all locations that match the crash risk factors.

Redundancy across the transportation system is key to reducing crashes. All parts of the system should be strengthened so if one part fails, others still protect roadway users. A simple example of this is rumble strips. This simple intervention protects people when their ability to be safe road users is compromised by distraction or drowsiness.

1 United States Department of Transportation. National Roadway Safety Strategy. January 2022 https://www.transportation.gov/sites/dot.gov/files/2022-02/USDOT-National-Roadway-Safety-Strategy.pdf

Figure 1. *The Safe System Approach, FHWA*



The Safe System **"approach"** is the broadest term. It describes all aspects of the Safe System, as shown in **Figure 1.**[2]

Safe System "**principles**" encompass the fundamental beliefs that the approach is built on. A successful Safe System approach weaves together all six principles that make up the graphic's outer ring.

Safe System "**elements**" serve as conduits to implement the Safe System approach. These promote a holistic approach to safety across the entire roadway system and acknowledge the shared responsibility principle. Committing to zero deaths means addressing every aspect of crash risks through these five elements that accommodate human mistakes and injury tolerances. The elements are presented in the middle ring of the graphic.

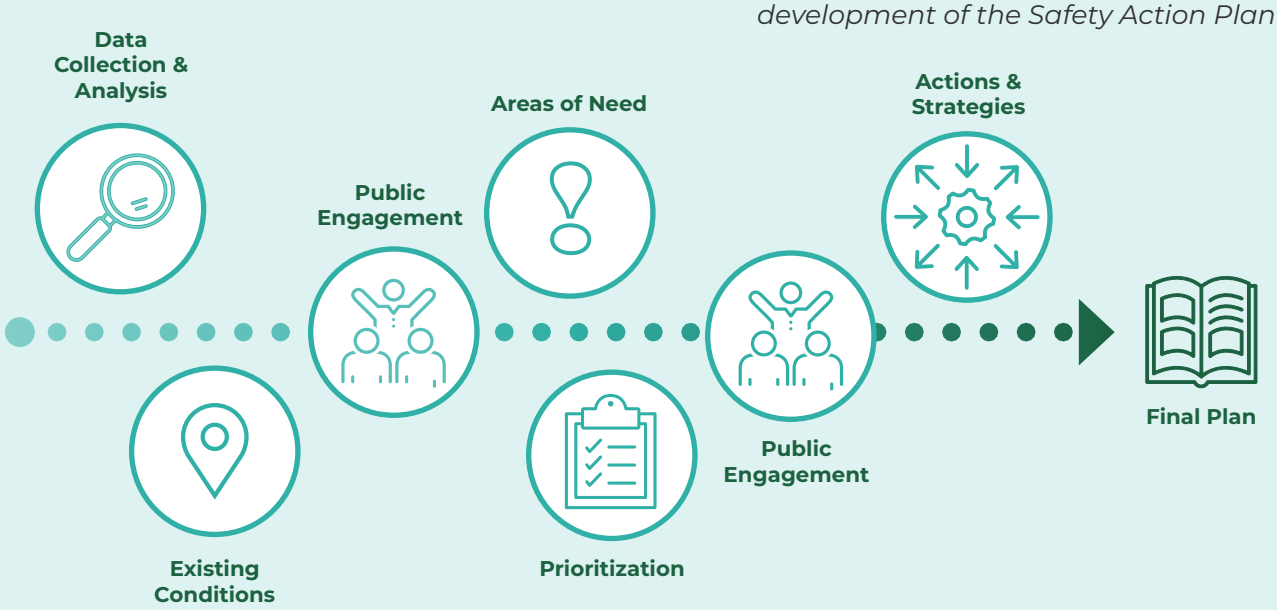
2 United States Department of Transportation Federal Highway Administration. The Safe System Brochure. 2022. https://safety.fhwa.dot.gov/zerodeaths/docs/FHWA_SafeSystem_Brochure_V9_508_200717.pdf


We Want Your Input!
Safety Action Plan
IMPROVING SAFETY FOR ALL ROA
List any specific locations in the Tri-County region (Cumberland, Dauphin, and Perry Counties) that believe have transportation
If you had the power to do so, what is the #1 thing you would do to make our roads safer?
(jot down your thoughts on post-it notes and place them in this box!)
(jot down your thoughts on post-it notes and place them in this box!)

PLANNING PROCESS

This Safety Action Plan was developed with important input from the public and a Safety Working Group made up of representatives from multiple agencies. The planning process integrated conversations with these interested parties into the project schedule to ensure methods for gathering feedback were equitable. The plan's development included two rounds of public engagement and five meetings of the Safety Working Group.

Figure 2. *Planning process and milestones in the development of the Safety Action Plan*



Safety Working Group

TCRPC convened a Safety Working Group made up of multidisciplinary partners from across the region to help develop and implement the Safety Action Plan. The Safety Working Group includes expertise outside of engineering, as the recommendations include a broader approach than just infrastructure.

The Safety Working Group included representatives from multiple agencies across the Tri-County Region. The group met five times during plan development to discuss issues including:

- Federal Safety Action Plan requirements and guidance
- TCRPC Safety Dashboard
- Goals and objectives
- Public engagement ideas
- Safety countermeasures
- Regional crash data summary by emphasis area
- Supplemental planning and demonstration funding
- Safety Action Plan recommendations

Safety Working Group Members

- Jeff Bergsten, Borough of Carlisle
- Lt. John Biever, State Police Troop H Section Commander
- William Brown, Silver Spring Township
- Jason Campbell, Dauphin County EMS Council
- Brian Enterline, City of Harrisburg
- Tyler Fairchild, Silver Spring Township
- Stephen Ferguson, Borough of Carlisle Police
- Chris Guarino, Silver Spring Township
- Michael Ibberson, Dauphin County Fire Chiefs Association
- Matt Kratz, Emergency Health Services Federation
- Darius Davenport, Tri-County Community Action
- Ted Leonard, AAA - Harrisburg
- Jeremy Miller, Hampden Township
- Nate Reis, PennDOT
- Thomas Stauffer, Swatara Township Police Department
- Lt. Ken Tallman, Pennsylvania State Police
- Garth Warner, Chief of Police – Derry Township
- Jared Woolston, Borough of Carlisle
- Deputy Police Chief Kenneth Young, City of Harrisburg Police
- Kenana Zejcirovic, PennDOT
- Steve Deck, TCRPC
- Andrew Bomberger, TCRPC
- Ben Warner, TCRPC

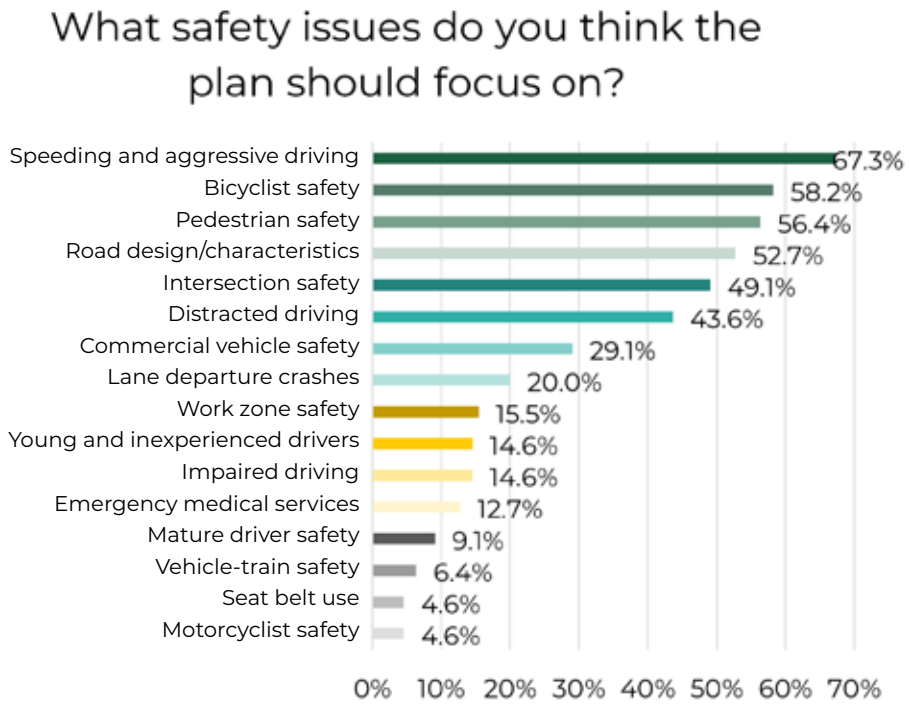
Public Engagement

The project team hosted several public engagement activities while the plan was being developed. An online survey gathered feedback throughout the planning process and was advertised through multiple pop-up events and meetings. The project team reviewed, summarized, and shared survey results during the first round of public engagement.

Top Roads of Concern from Community Feedback

- S. Hanover St (Carlisle)
- Carlisle Pike (Mechanicsburg)
- W. Trindle Rd (Cumberland County)
- High St (Carlisle)
- Front St (Harrisburg)
- State St (Harrisburg)
- US 11/15 (Duncannon-Marysville)
- Walnut Bottom Rd (Carlisle)
- Progress Ave (Susquehanna Township)
- Cameron St (Harrisburg)

Figure 3. *Online survey response summary*



Public Engagement Round 1

The first round of public engagement raised awareness about the Safety Action Plan, advertised the online survey, and informed the public of open house events through pop-up events on January 31 at Farmers on the Square in Carlisle and Foose Elementary School in Harrisburg.

The first open house was held in Swatara Township on February 28 and offered the public an overview of existing conditions and the plan's emphasis areas. The same content was shared at a second Open House on March 6 in Carlisle Borough.

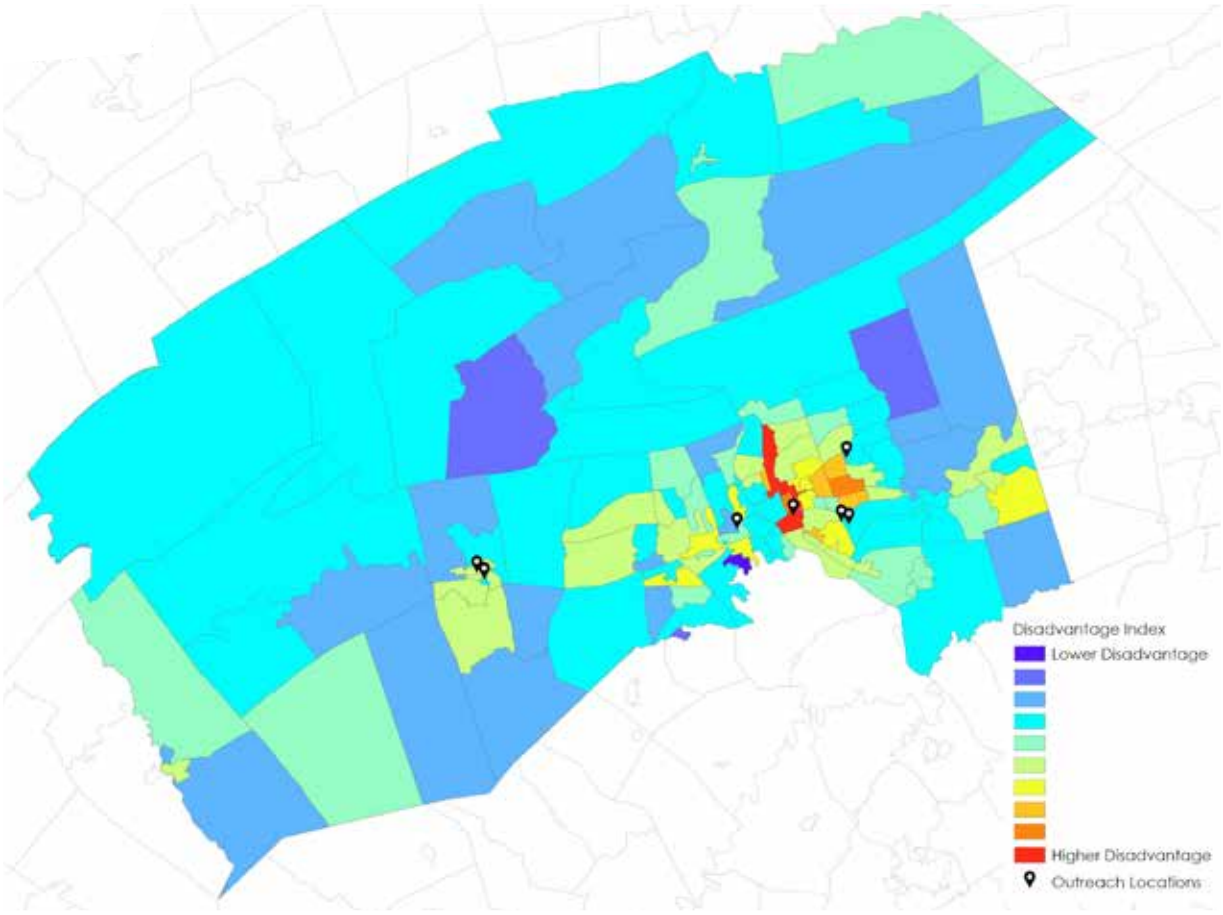
Content for the open houses included an overview of the SS4A program, goals and objectives for the plan, existing conditions analysis results, key safety issues, a summary of survey results, and interactive activities for gathering feedback.

Public Engagement Round 2

The second round of public engagement kicked off with a pop-up event on May 9 at TCRPC's Annual Luncheon. The pop-up event raised awareness about the Safety Action Plan, gave an overview of recommendations, and gathered feedback through an interactive activity.

Open houses during the second round of public engagement took place in Camp Hill on June 11 and Lower Paxton Township on June 12. Content for the open houses included an overview of the SS4A program, goals and objectives for the plan, and recommendations.

Figure 4. *Equity analysis results and outreach locations for the Tri-County Region*



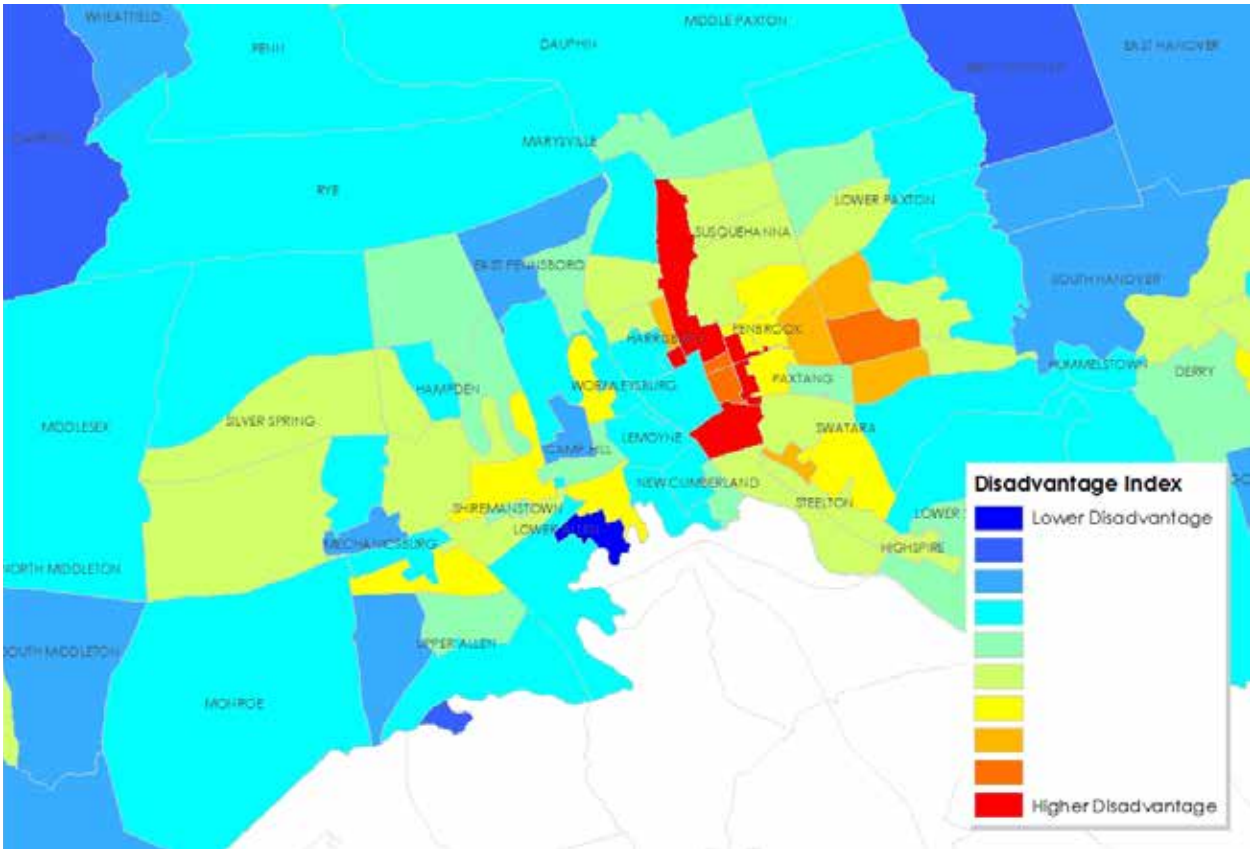
Equity Considerations

The project team completed an equity analysis to identify existing areas of disadvantage in the region. The analysis ensured that disadvantaged areas were included in the community engagement process and represented in project recommendations. The equity analysis used census data from the American Community Survey (ACS) to develop an index based on nine demographic indicators, including

- Black, indigenous, persons of color
- Poverty
- Zero-car households
- Population with a disability
- Older adults
- Youth
- Women
- Ethnic minority
- Foreign born
- Limited English proficiency

The index compares each area's data to the regional average and categorizes them into five levels: well below average, below average, average, above average, and well above average. These levels help show where higher concentrations of these populations live, ranging from 0 to 36 points for each area. This method follows federal guidelines to use Census data to identify and analyze these groups, ensuring that plans do not unfairly impact them.

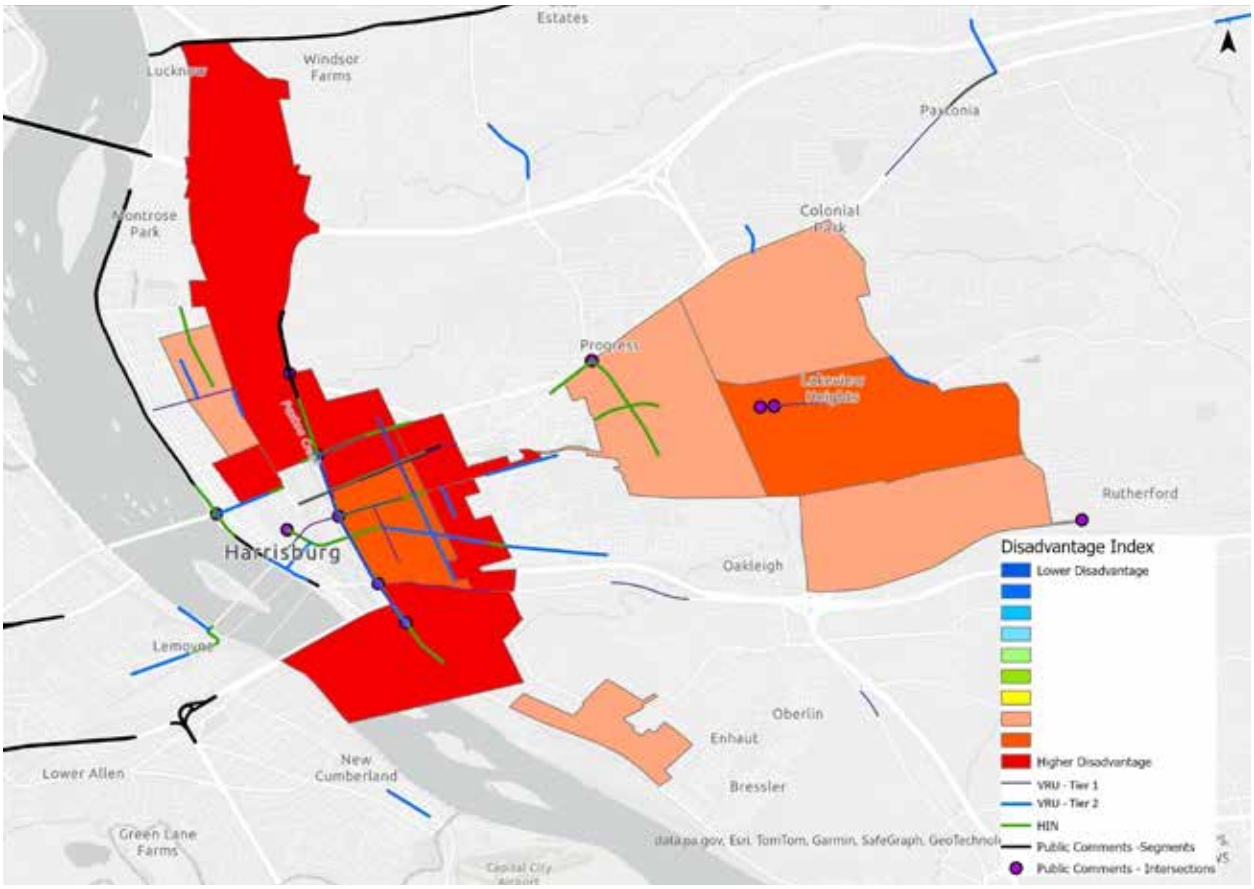
Figure 5. *Equity analysis results for the greater Harrisburg area*



The team used the results of this analysis to identify public meeting locations, in particular the pop-up event at Foose Elementary School in one of the most disadvantaged areas in the region. This outreach supported an emphasis on safety improvements in traditionally underserved communities.

Safety analyses were also overlaid on the equity analysis to ensure the team identified safety improvements needed in disadvantaged communities. The results of this overlay highlight higher disadvantage areas, High Injury Network (HIN) locations, Vulnerable Road User analysis locations, and input from public comment. These overlaps were used when prioritizing recommendations for road safety audit locations.

Figure 6. *Equity analysis and safety analysis overlay with public comments*



The team also pinpointed spot improvement locations for each county. This proved important for Perry County in particular, as crash data did not identify as many areas for improvement when compared to Dauphin and Cumberland counties. By ensuring that each county had at least one spot recommendation, the team considered rural community needs equitably.

Source: Dorret Oosterhoff, Kittelson

Source: Penndyl/Wikimedia Commons

Crash Data

Crash data was provided to the project team by TCRPC staff. The team compared this data with crashes reported from PennDOT's Crash Data Analysis and Retrieval Tool (CDART), which resulted in some slight variations between the two datasets.

Crashes reported from CDART were used for analysis, as they represented a more complete picture of total crashes in the Tri-County Region.

EXISTING CONDITIONS

Safety Data Analyzed

This section describes the analysis methods and results for crash patterns, trends, and systemic evaluation for HATS. The crash patterns and trends analysis were conducted to identify behavioral and roadway patterns associated with fatal and suspected serious injury crashes. The systemic evaluation identified locations for systemic safety improvements related to lane departure crashes. Findings from these analyses inform the countermeasures and strategies described in the following section.

Crash Data

The project team worked with TCRPC staff to assemble crash data for HATS. Some of the safety data was adapted from analyses recently conducted for PennDOT. Crash data included:

- **2018-2022 Crashes:** PennDOT dataset retrieved from the Crash Data Analysis and Retrieval Tool (CDART) including five complete years of reported crashes from January 1, 2018 through December 31, 2022.
- **2023 PennDOT Vulnerable Road User (VRU) Safety Assessment:** PennDOT dataset including the top locations in the state that are high risk areas (HRAs) for vulnerable road users, defined as non-motorists such as pedestrians, bicyclists, other cyclists, persons on personal conveyances, or injured persons that are pedestrians or pedalcyclists.

Community Factors Data

The project team worked with TCRPC staff to assemble community factors data for HATS, including:

- **Plain Sect Communities and Travel Routes:** The project team obtained data from TCRPC staff to determine where Plain Sect Communities and travel routes are located. This community factor data is important to consider with lane departure crashes, as applying rumble strips as a countermeasure may not be appropriate for communities that rely on horse and buggy travel.
- **Liquor-Licensed Establishments (2018-2022):** The team filtered data from the Pennsylvania Liquor Control Board to identify establishments with licenses to serve alcohol routinely on site, not just for occasions such as festivals or community events. Next, they mapped these establishments to see if there was a correlation between their presence and the frequency of impaired driver crashes.

Crash Patterns and Trends

The crash patterns and trends analysis identified behavioral and roadway patterns associated with fatal and suspected serious injury crashes. Analyzing reported crashes together reveals systemic trends.

The project team analyzed reported crashes involving motor vehicles, pedestrians, and bicyclists. Trends and findings are organized as follows:

- Overall High-Injury Network
- Test of Proportions
- Lane Departures
- Impaired Driving
- VRU Safety

Findings from this analysis helped inform the systemic evaluation and countermeasure considerations.

High Injury Network

The project team identified the Tri-County Region's high injury network (HIN) by applying the equivalent property damage only (EPDO) average crash frequency performance measure from the Highway Safety Manual (HSM). This performance measure assigns weighting factors to crashes by severity (i.e., fatality, injury, property damage only) to develop a combined frequency and severity score per location or portion of a corridor. The weighting factors are often calculated relative to property damage only (PDO) crash costs. The societal crash costs by severity and five years (2018 – 2022) of crash data are summarized, yielding an EPDO index value. The index values are then ranked in descending order to identify the high-ranking locations that make up the HIN.

The average cost per crash severity incorporates direct and indirect costs. Direct costs include ambulance services, police and fire services, property damage, and insurance. Indirect costs include the value society places on pain, suffering, or loss of life associated with a crash. Table 1 presents the 2022 average costs based on the maximum crash severity presented in PennDOT's 2022 Pennsylvania Crash Facts & Statistics.

A limitation of the EPDO performance measure is that it may overemphasize locations where severe (i.e., fatal or serious injury) crashes are not frequent. This performance measure is heavily influenced by the weighting factors for fatal injury crashes.

What Are "Reported Crashes"?

Crashes that are included in PennDOT's Crash Data Analysis and Retrieval Tool (CDART) database. Since some crash types like bicycle and pedestrian crashes are underreported, reported crashes do not represent total crashes. All crash data in this section is based on reported crashes.

What Are "Overrepresented Crash Types"?

Crash attributes (e.g., crash type, driver contributing circumstances) that has a higher proportion of crashes in HATS than statewide.

Table 1. *Estimated Total Societal Cost based on Maximum Crash Severity*

Maximum Severity	2022 Average Cost	Modified 2022 Average Cost	Weight
Fatal Injury Crashes	$14,093,600	$2,358,855	173
Suspected Serious Injury Crashes	$800,181	$2,358,855	173
Suspected Minor Injury Crashes	$258,548	$258,548	18
Possible Injury Crashes	$136,685	$136,685	10
Property Damage Only Crashes	$13,635	$13,635	1

When fatal injury crashes are given more weight, locations with one fatal injury crash and a small number of injury and/or PDO crashes may be ranked above locations with no fatal crashes and a relatively high number of injury crashes—especially suspected serious injury crashes.

Recognizing this limitation, the team modified the EPDO performance measure for this assessment by developing a composite average cost incorporating both fatal and suspected serious injury crashes. Refer to Table 1 for the modified 2022 average societal costs and weights used as part of this analysis.

To identify high injury corridors in the Tri-County Region, the project team calculated the EPDO index value along all roadways except limited access roads using a sliding window segmentation analysis. A sliding window analysis, as described in the HSM, examines a section of a corridor using a defined segment length (i.e., the window) and moves the limits of the analysis section along the corridor in defined increments. For this analysis, a window length of 0.5 miles and an increment of 0.1 miles was used for all roadways (i.e., local and state roads). This overlapping incremental analysis allows a more thorough corridor screening than other roadway segmentation methods.

The project team used ArcGIS to calculate the EPDO performance measure for every road in Cumberland, Dauphin, and Perry counties.

The team identified the corridors that comprise the HIN as follows:

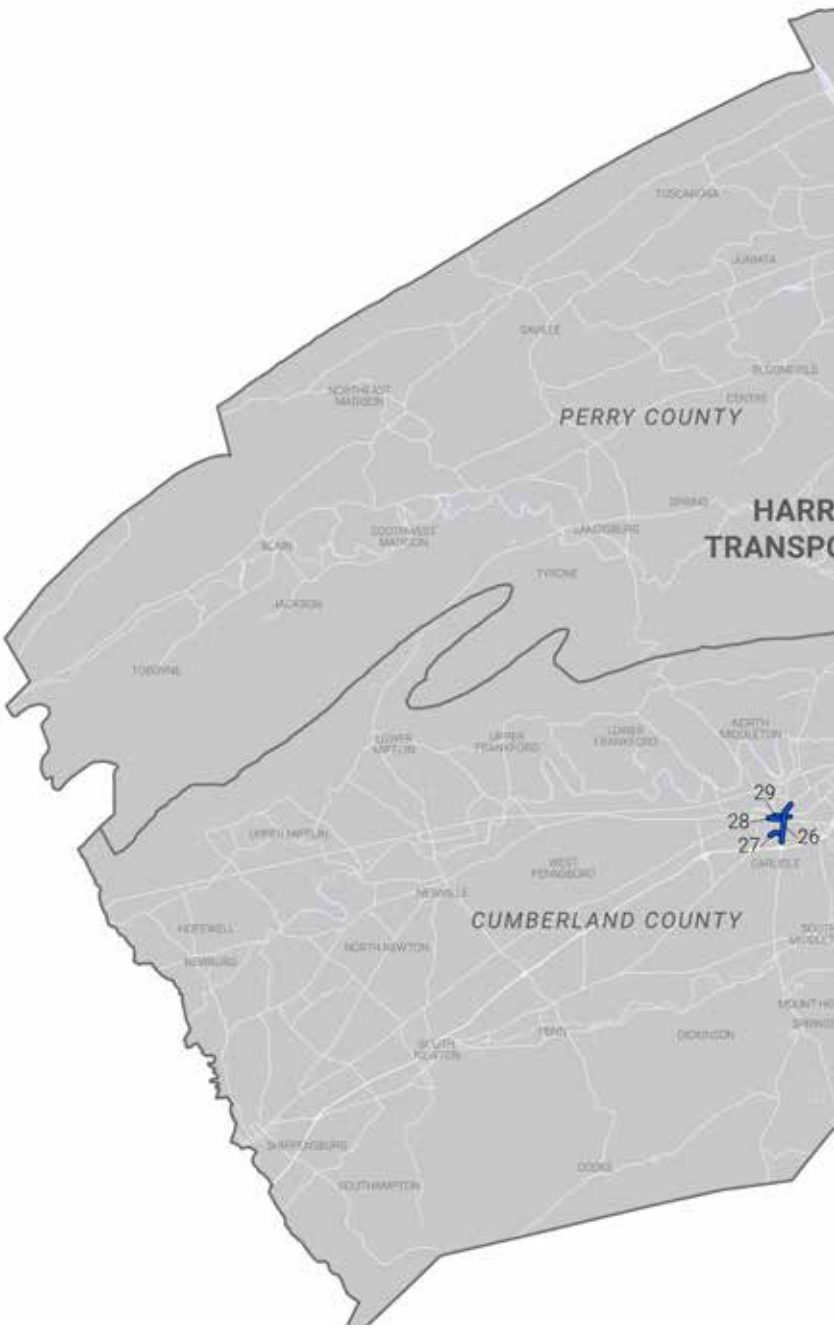
- The project team set the cutoff at an EPDO index value ≥ 200. This cutoff limits the number of safety projects to what can realistically be implemented.
- The team set the same EPDO index value cutoff for the entire region rather than giving each county a distinct cutoff. This allowed TCPRC to prioritize safety at locations with excessive EPDO index values across the Tri-County Region. No HIN locations were identified in Perry County.
- Tri-County locations with EPDO index values ≥ 200 were identified as HIN corridors.
- After populating the HIN, the project team performed a manual review of each corridor. In some cases, the extents were shortened to account for exact crash locations or combined with abutting and sometimes overlapping locations that were also on the HIN.

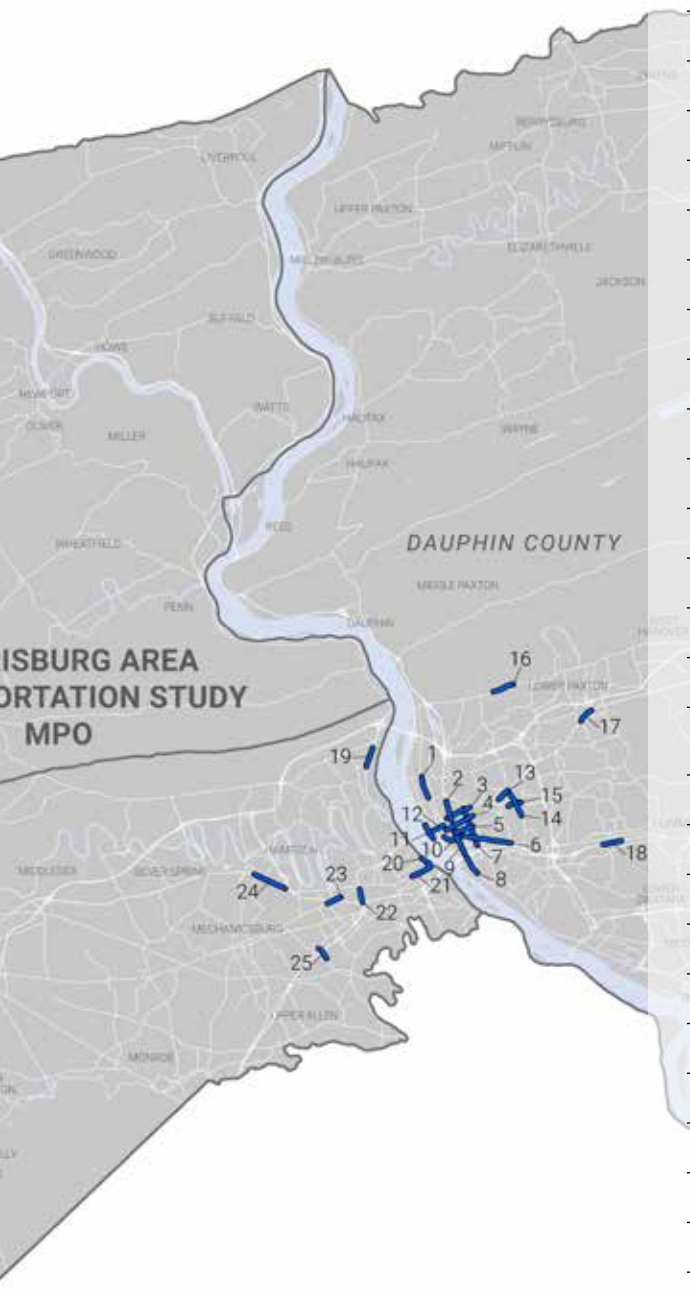
In total, 29 corridors were identified as part of the HIN. Cumberland County has 11 corridors and Dauphin County has 18. Perry County has no corridors that equal or exceed the 200 EPDO index threshold. For comparison, the corridor with the highest EPDO index value in Perry County had a value of less than 140. Figure 7 identifies the HIN for the Tri-County Region.

It was common for corridors with high EPDO index values to overlap. For example, in Dauphin County several overlapping segments combined to form longer HIN corridors. The 1.6-mile-long segment of Derry Street (Figure 7, ID 6) between Mulberry Street and 29th Street includes six overlapping segments and accounts for 20 fatal and suspected serious injury crashes. The 1.3-mile-long segment of 17th Street (Figure 7, ID 7) between Sassafras Street and Brookwood Street South encompasses five overlapping segments and accounts for 12 fatal and suspected serious injury crashes. In Cumberland County, the 1.3-mile-long segment of Hanover Street (Figure 7, ID 26) between Gardners Avenue and Noble Boulevard has six overlapping segments and accounts for eight fatal and suspected serious injury crashes.

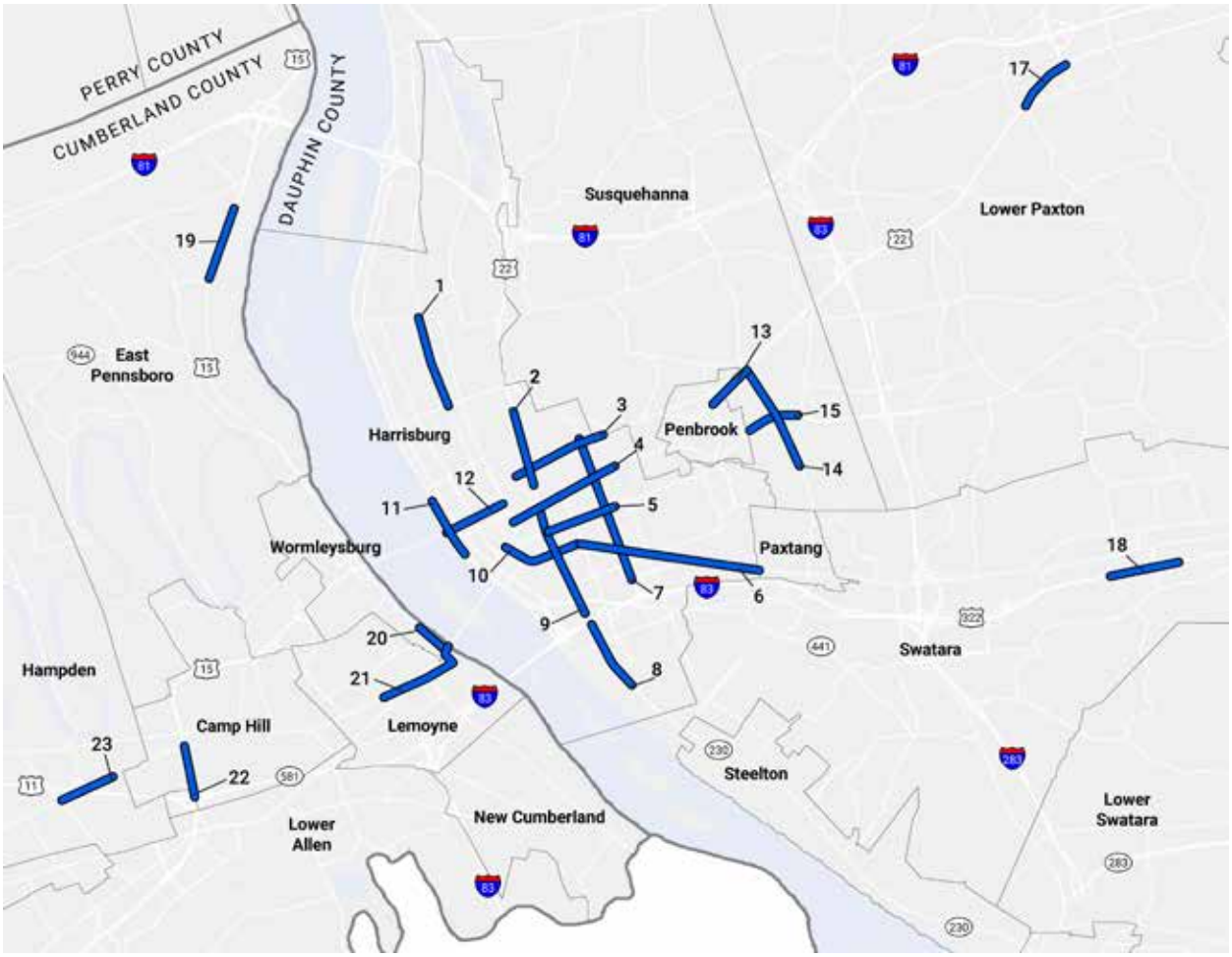
Figure 7. *High Injury Network for HATS*

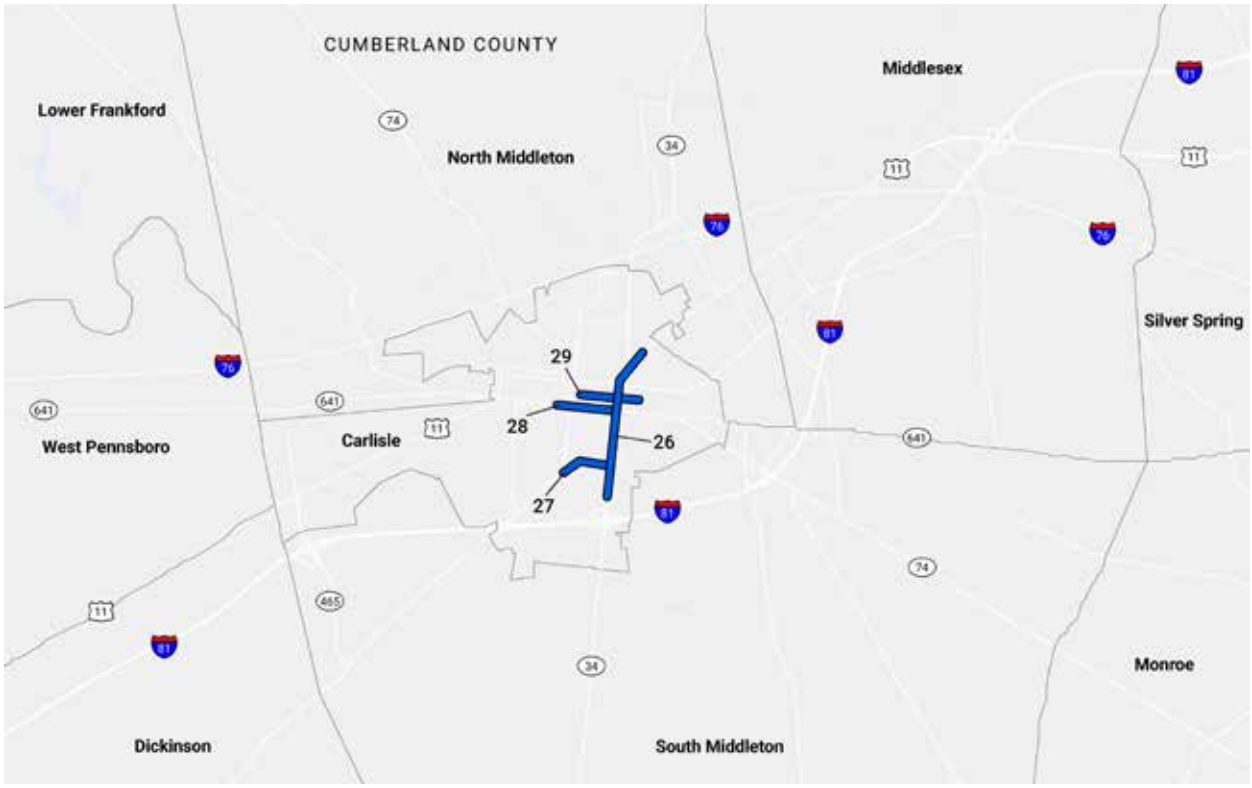
See following page for details of the Harrisburg and Carlisle areas.





Map ID	Corridor
1	N 6th St between Radnor St and Division St
2	N Cameron St between Kelker St and Forster St
3	Herr St between N 9th St and N 19th St
4	State St between N 7th St and N 19th St
5	Market St between Cameron St and N 18th St
6	Derry St between Mulberry St and S 29th St
7	17th St between Sassafras St and Brookwood St
8	S Cameron St between Salmon St and south of Magnolia St
9	N Cameron St between north of Walnut St and Hanna St
10	Mulberry St/4th St between Derry St and Walnut St
11	Front St between Sayford St and Academy Aly
12	Forster St between west of Front St and 7th St
13	Walnut St between S 28th St and Progress Ave
14	Progress Ave between Walnut St and Harwood Dr
15	Union Deposit Rd between Larry Dr and Shield St
16	Linglestown Rd between west of Oakhurst Blvd and Versailles Dr
17	Allentown Blvd between S Mountain Rd and Johnson St
18	Paxton St between Harris TV & Appliance and Walmart
19	N Enola Rd between north of 3rd St Ext and Columbia Rd
20	Front St between 3rd Ave and Market St
21	Market St between 8th St and northeast of Front St
22	32nd St between Trindle Rd/Chestnut St and Harrisburg Expy
23	Trindle Rd between St Johns Church Rd and 38th St
24	Carlisle Pike between Salem Church Rd and Gateway Dr
25	Rossmoyne Rd between Gettysburg Rd and Westport Dr
26	N Hanover St between Gardners Ave and Noble Blvd
27	Willow St/Walnut Bottom Rd between Hanover St and College St
28	High St between Hanover St and Moreland Ave
29	Louther St between west of West St and east of Bedford St





See previous page for legend.

Source: Dorret Oosterhoff/Kittelson

High Injury Network Overlaps with PennDOT Network Screening

The PennDOT network screening looked at road segments and intersections and ranked them by priority in safety improvement. Within the Tri-County Region, 6 road segments and 21 intersections on the 2021 PennDOT network screening list partially or entirely overlap the HIN corridors identified in this analysis. This portion of the report does not include Perry County since the analysis identified no HIN corridors within the county, as seen in Figure 7.

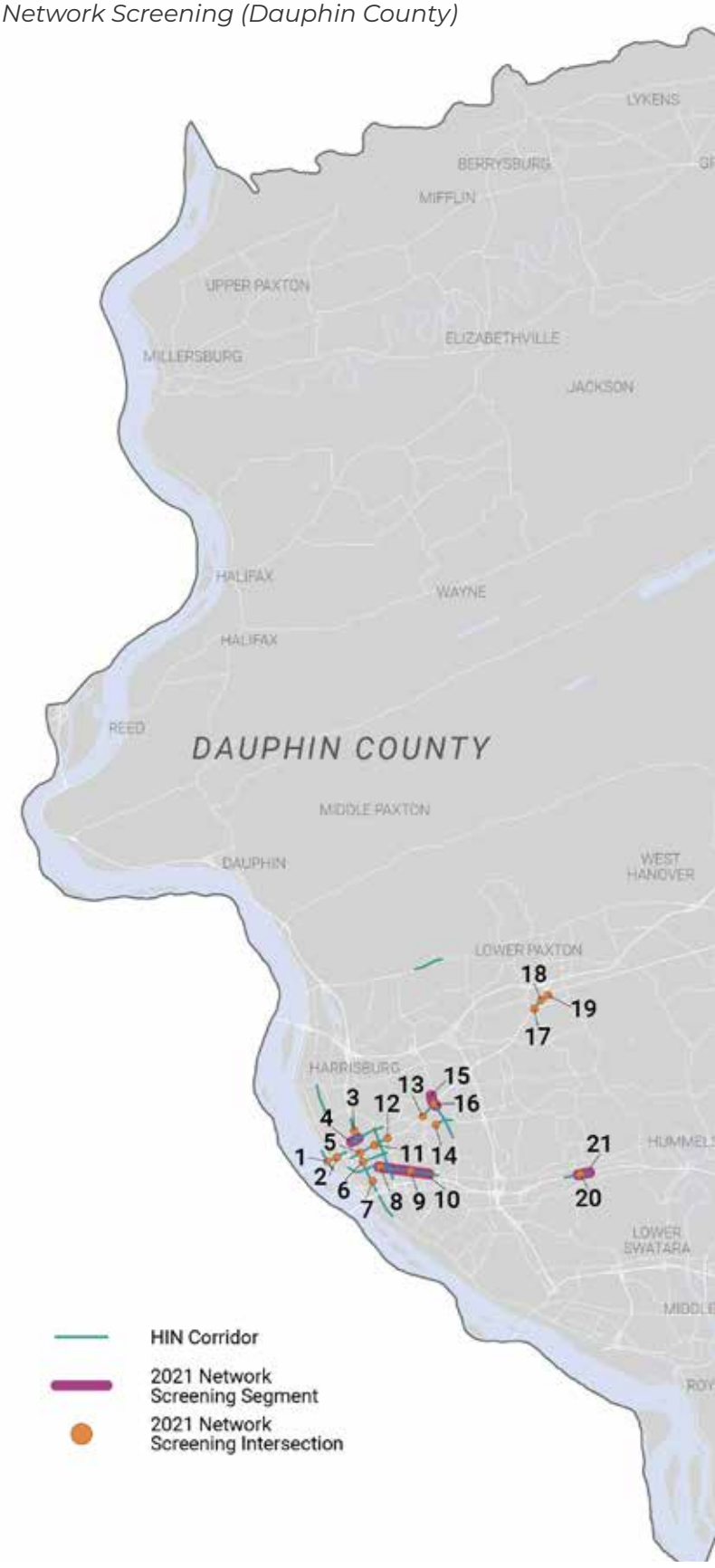
Within Dauphin County, 4 segments and 17 intersections on the PennDOT list of network screening locations overlapped with HIN corridors. Two of the four segments ranked highly on PennDOT's list:

- Paxton St from Mushroom Hill Dr to a quarter mile to the east (Figure 8, ID 21)
- Derry St between S 14th St and S 25th St (Figure 8, ID 10)

Of the 17 intersections within Dauphin County that overlap with the PennDOT network screening, Forster St at Front St (ID 1) ranked highest on PennDOT's list of intersections needing safety improvements, and Walnut St at 28th St (ID 13) ranked second. Figure 8 illustrates the overlap between the HIN and the 2021 network screening locations for Dauphin County.

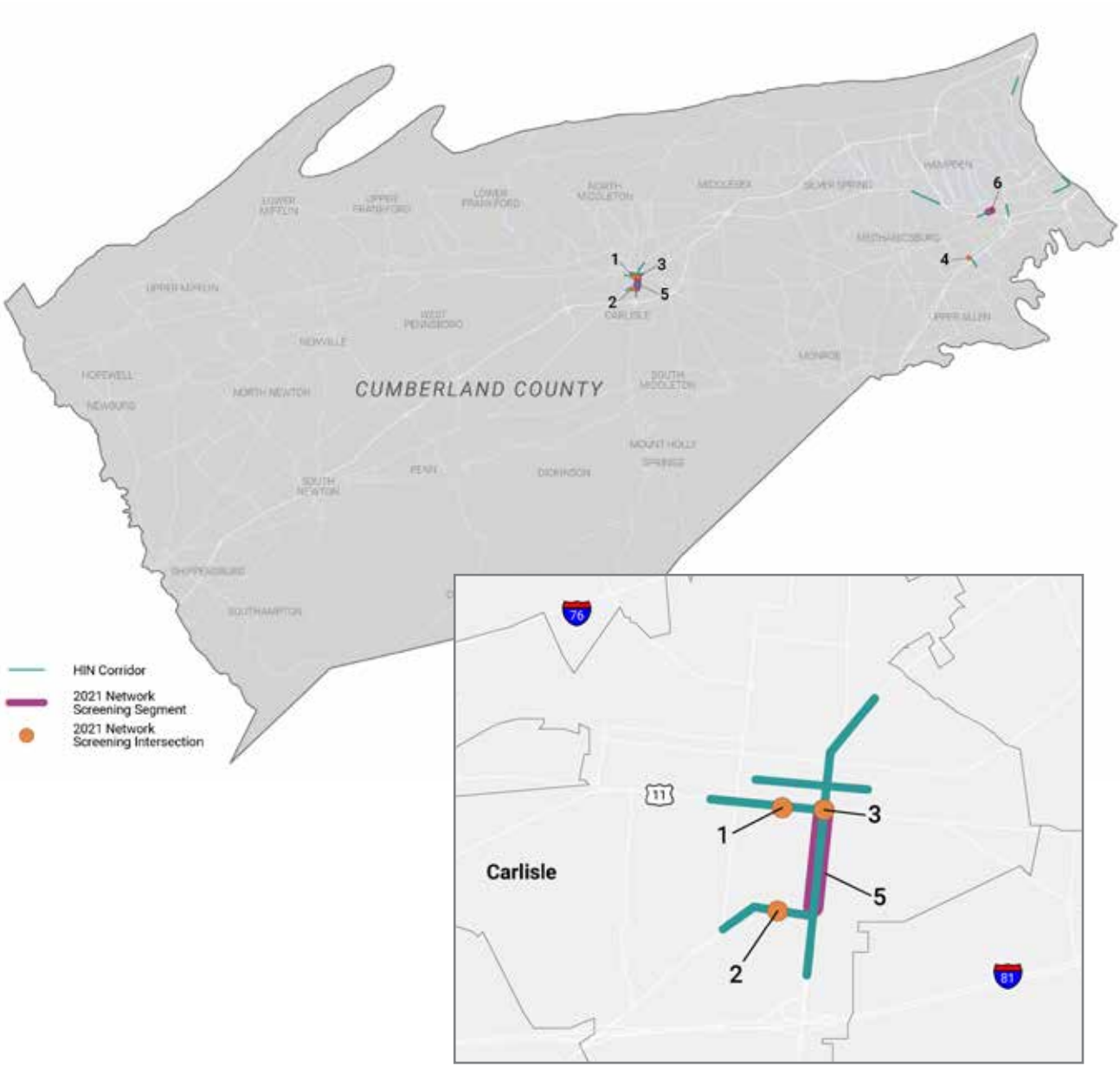
For Cumberland County, 2 segments and 4 intersections on the 2021 PennDOT network screening list overlap with the HIN identified in this analysis. Of the four overlapping intersections, Wesley Dr at Gettysburg Rd (Figure 9, ID 4) ranked second on PennDOT's list of intersections needing safety improvements. Figure 9 illustrates the overlap between the HIN and the 2021 network screening locations for Cumberland County.

Figure 8. *High Injury Network Overlap with Network Screening (Dauphin County)*



County	Facility Type	ID	Location
Dauphin	Intersection	**1**	Forster St and N Front St
Dauphin	Intersection	**2**	Forster St and N 3rd St
Dauphin	Intersection	**3**	N Cameron St and Calder St
Dauphin	Segment	**4**	Herr St btw N 9th St and Monroe St
Dauphin	Intersection	**5**	S Cameron St and S 13th St
Dauphin	Intersection	**6**	S Cameron St and Market St
Dauphin	Intersection	**7**	S Cameron St and Berryhill St
Dauphin	Intersection	**8**	Derry St and S 14th St
Dauphin	Intersection	**9**	Derry St and S 21st St
Dauphin	Segment	**10**	Derry St btw S 14th St and S 25th St
Dauphin	Intersection	**11**	State St and N 16th St
Dauphin	Intersection	**12**	State St and N 19th St
Dauphin	Intersection	**13**	Walnut St and S 28th St
Dauphin	Intersection	**14**	Market St and Canby St
Dauphin	Segment	**15**	N Progress Ave btw Spring St and Old Orchard Rd
Dauphin	Intersection	**16**	Walnut St and S Progress Ave
Dauphin	Intersection	**17**	Jonestown Rd and Johnston St
Dauphin	Intersection	**18**	Jonestown Rd and Lincoln St
Dauphin	Intersection	**19**	Jonestown Rd and Mountain St
Dauphin	Intersection	**20**	Paxton St and Mushroom Hill Rd
Dauphin	Segment	**21**	Paxton St btw Mushroom Hill Rd and 1/4 mile to the east

Figure 9. *High Injury Network Overlap with Network Screening (Cumberland County)*



County	Facility Type	ID	Location
Cumberland	Intersection	**1**	High St and Pitt St
Cumberland	Intersection	**2**	Willow St and Pitt St
Cumberland	Intersection	**3**	Hanover St and High St
Cumberland	Intersection	**4**	Wesley Dr and Gettysburg Rd
Cumberland	Segment	**5**	Hanover St btw Willow St and High St
Cumberland	Segment	**6**	E Trindle Rd btw S 38th St and April Dr

FATALITIES TEST OF PROPORTIONS

The project team reviewed the 2022 Pennsylvania SHSP to ensure consistency with statewide goals. The SHSP outlines Priority Emphasis Areas, which provide a blueprint to address fatalities and suspected serious injuries on Pennsylvania roadways. Statewide Priority Emphasis Areas include:

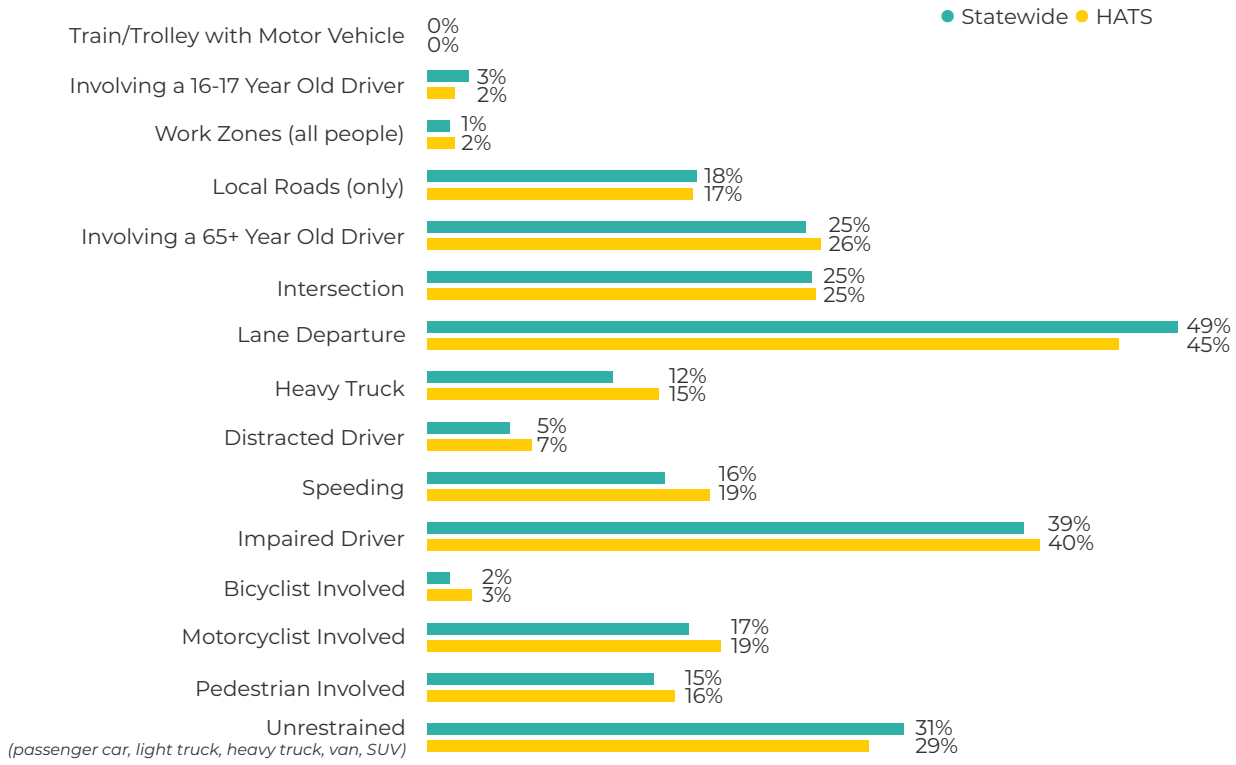
- Lane departure crashes
- Impaired driving
- Pedestrian safety

In addition to evaluating the three SHSP Priority Emphasis Areas, the team conducted a Test of Proportions to assess the proportion of fatalities by crash type and determine if the team should evaluate other emphasis areas specific to HATS. The Test of Proportions identified impaired driver crashes as being overrepresented in the HATS area compared to statewide crashes, as shown in Figure 10, reemphasizing its inclusion in this analysis.

Heavy truck crashes and speeding crashes were also overrepresented in the data. The team conducted an additional correlation analysis to decide if these overrepresented crash types should be added as emphasis areas.

For heavy truck crashes, the team found that fatalities occurred in areas with similar characteristics to those with a high number of pedestrian or vulnerable road user crashes. For speeding crashes, the team found that fatalities are closely correlated with both lane departure and impaired driving crashes. Given these redundancies in crash patterns, the team determined the three SHSP Priority Emphasis Areas would be appropriate for this Safety Action Plan. For consistency with the VRU Safety Assessment, bicyclist safety was considered alongside pedestrian safety.

Figure 10. *Proportion of Fatalities by Crash Type (January 2018 – December 2022)*



LANE DEPARTURES

Lane departure crashes can occur on any road. However, according to a previous analysis done for PennDOT, they are most likely to happen at the curved sections of rural, two-lane roads within PennDOT District 8-0. This conclusion was determined by cataloging where most historic lane departure crashes occurred on roadways within the district based on four attributes: land use (urban/rural), divisor type (divided/undivided), lane count, and speed limit. After that, the analysis classified those roadways according to FHWA's lane departure risk factors: curve angle, curve radius, total pavement width, annual average daily traffic (AADT), and collision objects to determine the specific road characteristics which had an overrepresented amount of lane departure crashes. This portion of the report builds on the work done by that previous analysis. However, it focuses on the Tri-County Region by identifying lane departure crash locations and roads with the identified problematic characteristics.

Lane Departure Crash Mapping

The lane departure crashes reported for HATS from 2018 to 2022 are presented in Figure 11. Crashes are common throughout the region, appearing to cluster along Interstates and around urbanized areas of Cumberland County and Harrisburg. Lane departure crashes on rural two-lane roads are presented in Figure 12.

Figure 11. *HATS Lane Departure Crashes (January 2018 – December 2022)*

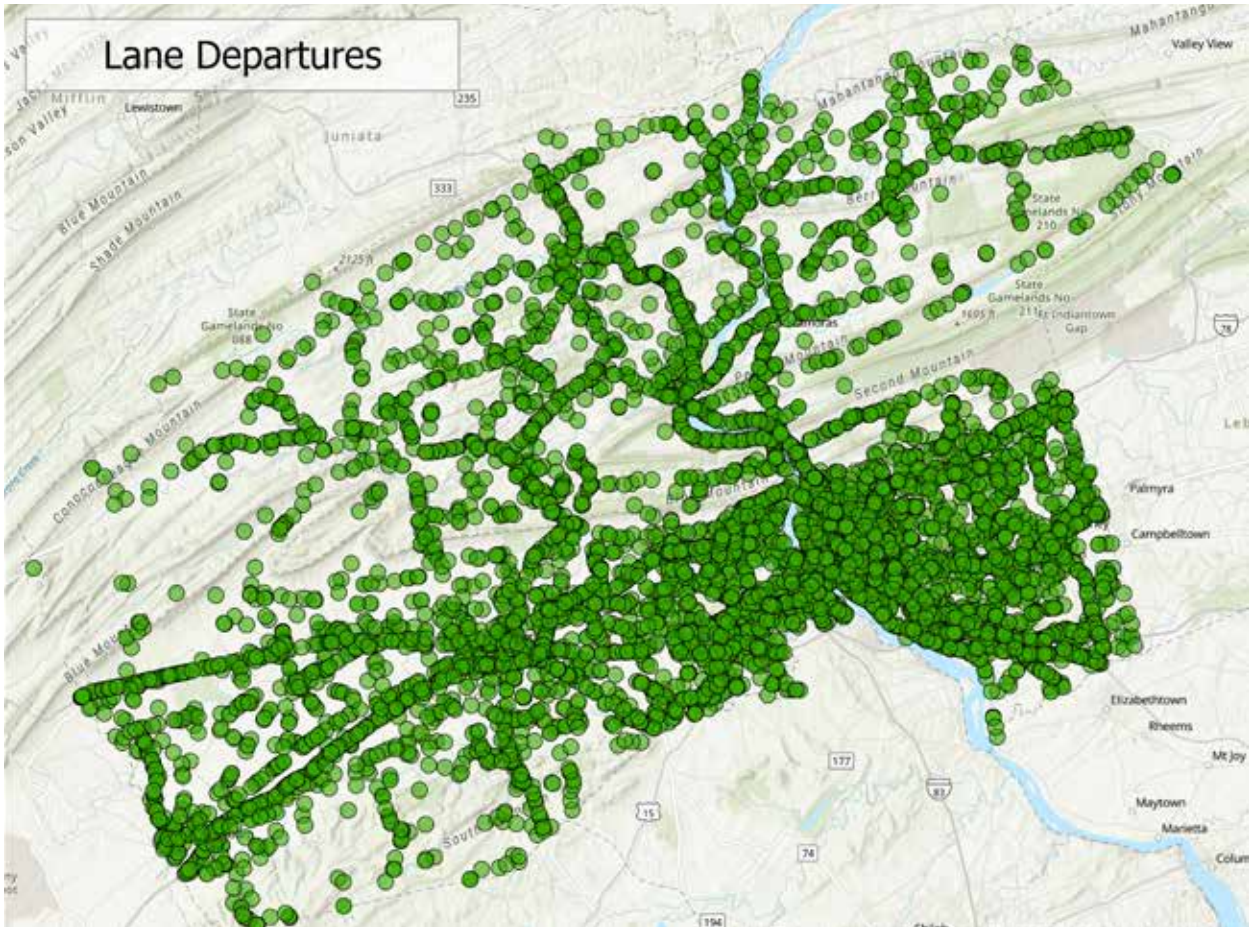
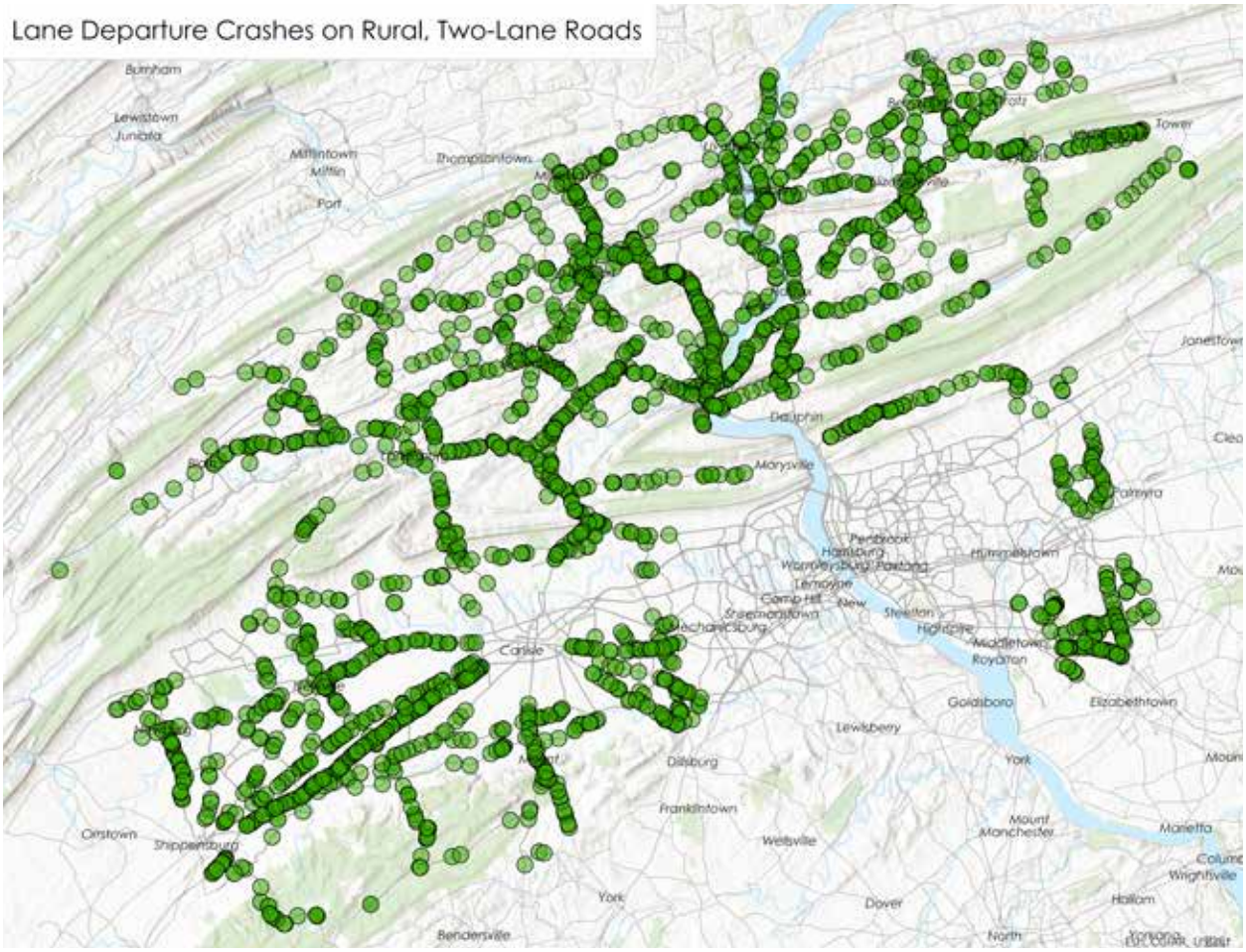


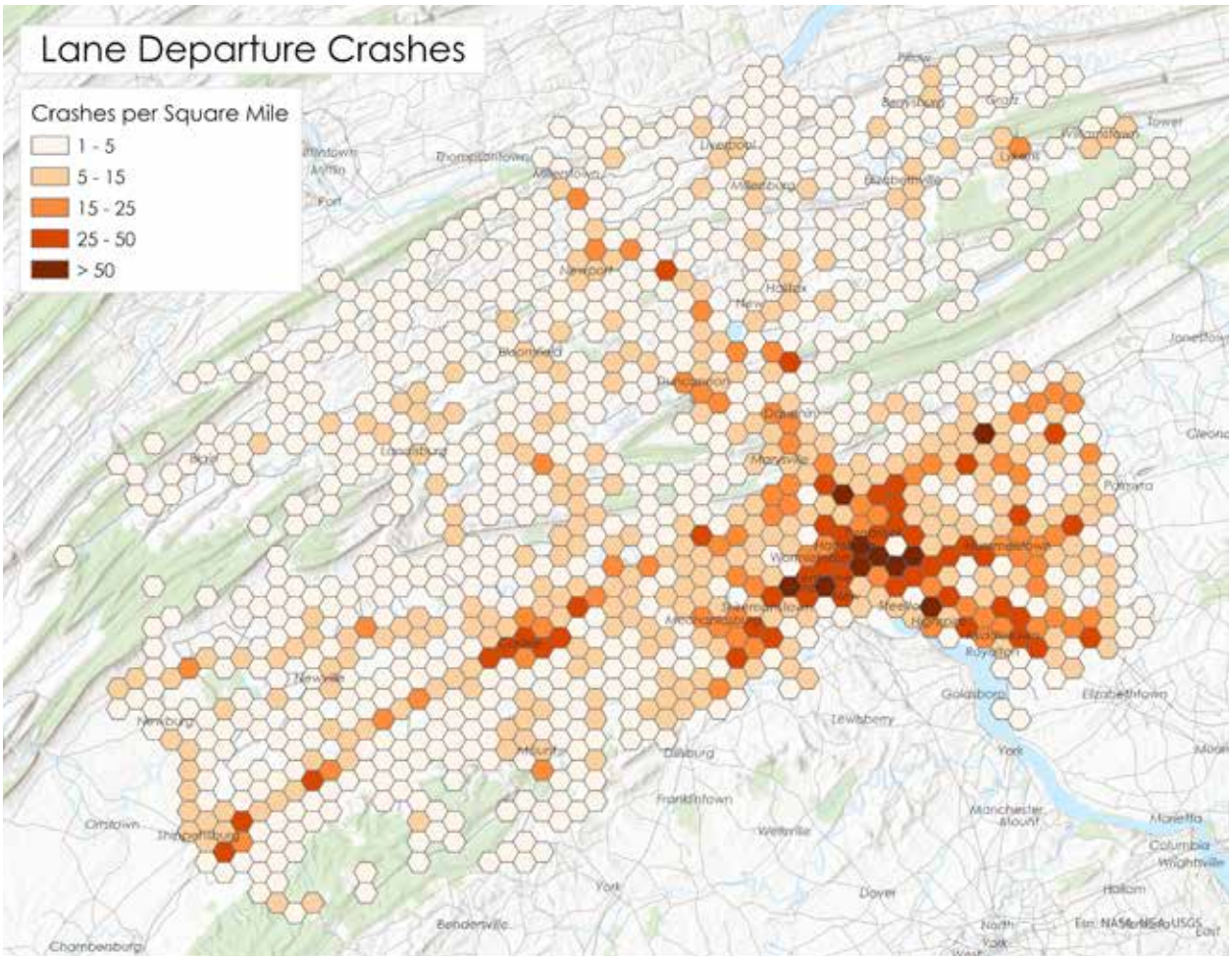
Figure 12. *HATS Lane Departure Crashes on Rural Two-Lane Roads (January 2018 – December 2022)*



Lane Departure Crash Density

To clarify the lane departure crashes shown in Figure 11, Figure 13 maps crash density within a square-mile hexagon. This figure helps identify which corridors have notably high crash rates. Interstate 81 has a higher crash density between Shippensburg in the southwest and Jonestown in the east. US 322 has high crash volumes between Millerstown in the north and Harrisburg, and in the immediate area surrounding Harrisburg.

Figure 13. *HATS Lane Departure Crash Density (January 2018 – December 2022)*



Lane Departure Systemic Analysis

With the high number of lane departure crash locations, the previous analysis conducted for District 8-0 was done for only the Tri-County Region to develop a ranked list of locations at risk for lane departure crashes. As before, historic lane departure crashes within the region were categorized to determine which roadway facilities saw the majority of crashes and which FHWA risk factor characteristics experienced an overrepresented amount of lane departure crashes. The conclusion was a list of 50 segments across all three counties that could benefit from safety improvements.

These 50 segments (actually 52, accounting for tied rankings) were field reviewed to determine appropriate countermeasures and data on Plain Sect routes were overlaid to ensure rumble strips are not used in those communities. It has been found that rumble strips can injure horses, thereby limiting horse-and-buggy travel for Amish, Mennonite, and other Plain Sects. These segments and potential countermeasures are listed below.

Table 2. *Top 52 Lane Departure Treatment Locations*

Rank	County	Street	Start	End	Rumble Strips	Chevron	Edge Lines	Median Barrier
1	Dauphin	Peters Mountain Rd	Matamoras Rd	Maple Ave	Y	Y	N	N
2	Cumberland	York Rd	Park PL	Creekview Ln	Y	N	N	N
3	Dauphin	S River Rd	0.23 mile west of Swopes Taxidermy	Walsh Rd	Y	N	N	N
4	Cumberland	York Rd	Sheaffer Rd	Park PL	Y	N	N	N
5	Perry	Spring Rd	1.34 mile south east of 7938-7932 Spring Rd	1.83 South east Paul's Store-All	Y	Y	N	N
6	Dauphin	State St	0.27 mile east of Creative Changes By Carrie Ann	Coleman Dr	Y	Y	N	N
7	Perry	Landisburg Rd	Warm Springs Rd	0.48 mile east of Shermans Creek Supply	Y	Y	N	N
8	Perry	Spring Rd	Huckelberry Rd	1.65 mile south east of Perry Lanes	Y	N	N	N
8	Perry	Landisburg Rd	Pike Rd	Warm Springs Rd	Y	Y	N	N
10	Perry	Spring Rd	0.08 mile north of Untitled Tracks musical instrument shop	0.33 mile south west of Conrad's Catering and BBQ Pit	Y	Y	N	N
11	Dauphin	S River Rd	0.82 mile north of Jr's Garage	0.22 mile west of Swopes Taxidermy	Y	N	N	N
12	Cumberland	Spring Rd	Mountain Rd	Sunnyside Dr	Y	Y	N	N
13	Perry	Spring Rd	0.17 mile north west of Gilbert's Martial Arts Academy	Landisburg Rd	Y	Y	N	N
14	Cumberland	Centerville Rd	Green Ridge Ln	0.06 mile south east of J.P. Wolfe Insurance	Y	N	N	N
15	Cumberland	Carlisle Rd	Creek Rd	Lefever Rd	Y	Y	N	N
15	Cumberland	Sunny Side Dr	1.38 mile south east of Regency Mobile Home Parks	0.93 mile south east of Regency Mobile Home Parks	Y	Y	N	N
17	Perry	Landisburg Rd	0.12 mile south west side of Wolf Diesel	Pike Rd	Y	Y	N	N
18	Cumberland	Boiling Springs Rd	Lutztown Rd	York Rd	Y	N	N	N
19	Cumberland	Locust Point Rd	Timber Rd	Texaco Rd	Y	Y	N	N
20	Dauphin	S River Rd	Million Dollar Rd	0.22 mile south west side of Hidden Hollow Salon	Y	N	N	N

Rank	County	Street	Start	End	Rumble Strips	Chevron	Edge Lines	Median Barrier
21	Dauphin	Laudermilch Rd	Shady Ln	0.52 mile south east of East Hanover Mennonite Church	Y	Y	N	N
22	Dauphin	S River Rd	0.22 mile south west side of Hidden Hollow Salon	Shammos School Rd	Y	N	N	N
23	Cumberland	Carlisle Rd	Lefever Rd	Green Hill Rd	Y	N	N	N
24	Cumberland	Locust Point Rd	Texaco Rd	Kost Rd	Y	N	N	N
25	Perry	Aqueduct Rd	0.65 mile south of Redemption Cycleworks	Linton Hill Rd	Y	N	Y	N
26	Dauphin	Mountain House Rd	1 mile south west of Camp Small Valley	Hemlock Rd	Y	Y	N	N
27	Perry	Fort Robinson Rd	0.27 mile east of Sonshine Ministries	0.26 mile south of Center Presbyterian Church	N	N	N	N
28	Dauphin	Erdman Rd	W Camp Rd	Lubolds School Rd	Y	Y	N	N
29	Cumberland	Waggoners Gap Rd	0.13 mile notth east of North Mountain Inn Inc	0.91 mile east of Cliff Jones Field Station, National Audubon Society	Y	N	N	N
30	Dauphin	Fishing Creek Valley Rd	0.10 mile east of Valley Grocery	Potato Valley Rd	Y	N	N	N
31	Perry	Red Hill Rd	Bucks Valley Rd	Mountain Rd	Y	N	N	N
32	Cumberland	Doubling Gap Rd	1.27 mile north of Doubling Gap Center Camp YoliJwa	1.25 mile north of Doubling Gap Center Camp YoliJwa	Y	Y	N	N
33	Perry	Veterans Wy	1.53 mile west of Mountain Supply LLC	1.89 mile west of Mountain Supply LLC	Y	Y	N	N
33	Perry	Dellville Rd	0.06 mile west of HCS Property Preservation LLC	0.58 mile west of Martz Farms	Y	Y	N	N
33	Cumberland	Furnace Hollow Rd	Walnut Bottom Rd	0.27 mile east of Martin Woodworking	Y	Y	N	N
33	Cumberland	Steelstown Rd	1.03 mile north west of Kreitzer's Truck Repair	Windy Hill Rd	Y	Y	N	N
33	Perry	Erly Rd	0.48 mile north east of Mannsville Lutheran Church	Buttonwood Rd	Y	Y	N	N
33	Cumberland	Mcclures Gap Rd	Willow Grove Rd	Campground Rd	Y	Y	N	N

Rank	County	Street	Start	End	Rumble Strips	Chevron	Edge Lines	Median Barrier
39	Dauphin	Fishing Creek Valley Rd	0.60 mile west of Fishing Creek Labs & Mountain Dogs	0.08 mile west of Fishing Creek Labs & Mountain Dogs	Y	Y	N	N
40	Perry	Juniata Py	0.47 mile south east of Freeland-Long Burial Ground	0.41 mile south of Howe Township Municipal Authority	Y	N	N	N
41	Dauphin	Market St	In front of Klinger Lumber	In front of Elizabethville Area Authority	N	N	N	N
42	Perry	Waggoners Gap Rd	0.91 mile southy east of MILTS GARAGE & BODY SHOP	0.26 mile southy east of MILTS GARAGE & BODY SHOP	Y	N	N	N
42	Perry	Veterans Wy	Green Park Rd	0.50 mile north west of Kingdom Grounds Café	Y	Y	N	N
42	Cumberland	Wertzville Rd	Sherwood Dr	Mountain Rd	Y	Y	N	N
42	Cumberland	Shippensburg Rd	1.81 mile north east of Tiger Stadium	2.27 mile north east of Tiger Stadium	Y	Y	N	N
46	Cumberland	York Rd	Creekview Ln	Lutztown Rd	Y	N	N	N
46	Cumberland	Pine Rd	Yellowbreeches Rd	Barnitz Rd	Y	Y	N	N
48	Perry	Veterans Wy	Buffalo Trace	Boots Hollow Rd	N	Y	N	N
48	Perry	Creek Rd	Milford Rd	Cemetary Rd	Y	Y	N	N
48	Perry	Fort Robinson Rd	0.24 mile south of east of Center Presbyterian Church	0.62 mile south of east of Center Presbyterian Church	N	Y	N	N
48	Perry	Dellville Rd	0.59 mile north west of Dellville United Methodist Church	0.86 mile west of Etters Unique Landscaping Inc	Y	Y	N	N
48	Dauphin	Manada Bottom Rd	Rabbit Ln	Cliff Rd	Y	Y	Y	N
48	Dauphin	Powells Valley Rd	4.49 mile south west of East End Main Trailhead	2.75 mile east of St James Independent Church	Y	N	N	N

Right: One-way traffic heads west on the Walnut Street Bridge in Harrisburg, Pa., toward Wormleysburg, September 1958.

Source: dfirecop/Wikimedia Commons

Source: Oregon DOT

IMPAIRED DRIVING CRASHES

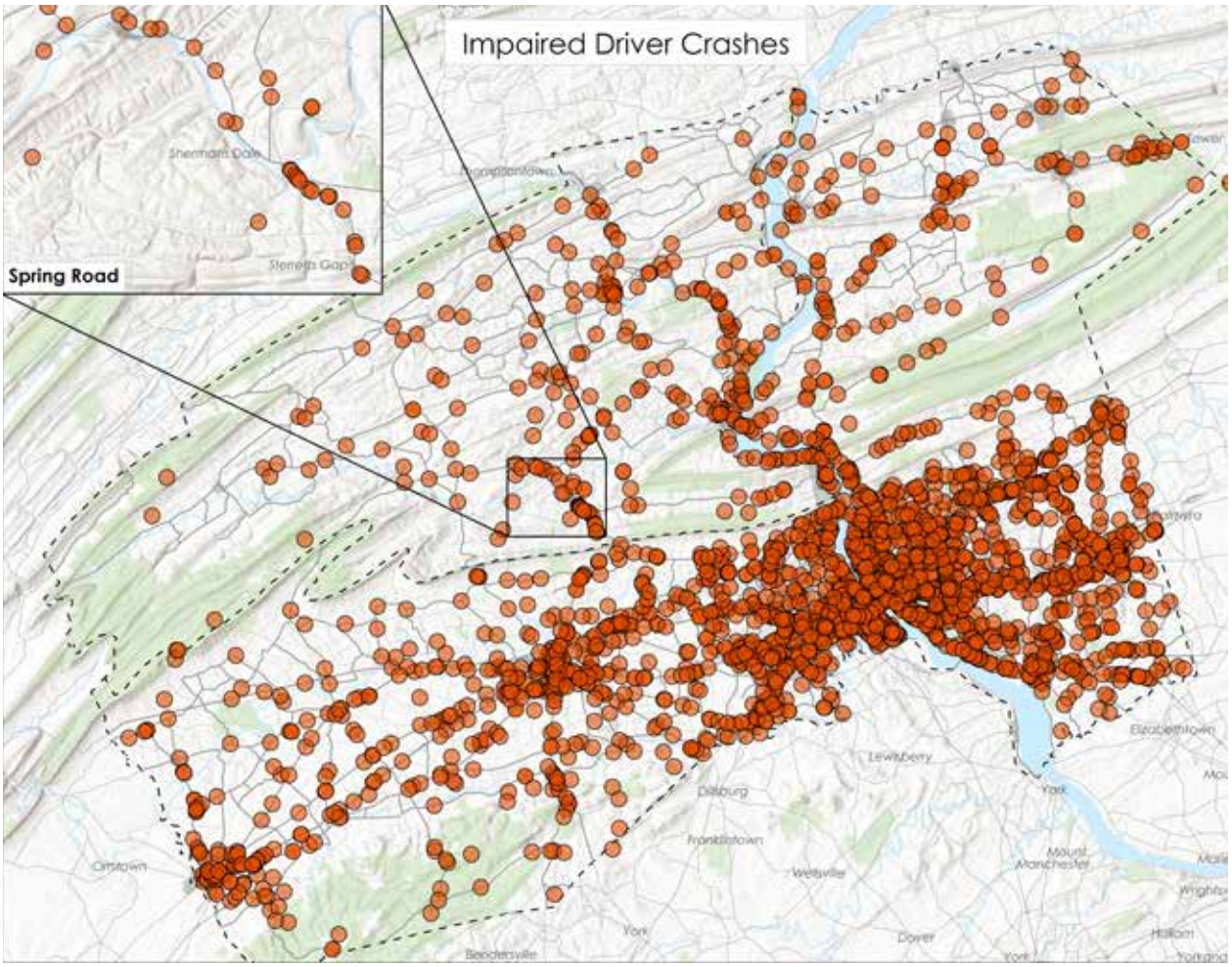
Impaired driving crashes may occur on any road or street. Roadway characteristics do not tend to be closely correlated with impaired driving crashes. Because of this, education and enforcement strategies are generally more effective than physical countermeasures. It is particularly important to identify location patterns to implement successful, geographically focused education and enforcement campaigns.

Overall data snapshots of impaired driving crashes are shown in Figure 14 and Figure 15.

Impaired Driving Crash Mapping

Impaired driver crashes reported for HATS from 2018 to 2022 are presented in Figure 14. These crashes cluster around urban centers and along the region's primary corridors, including Interstates 81 and 76, and US highways 22 and 209. Perry County's Spring Road, which connects the county to Cumberland County via Sterretts Gap, also has a high number of impaired driver crashes not seen along other more rural roads.

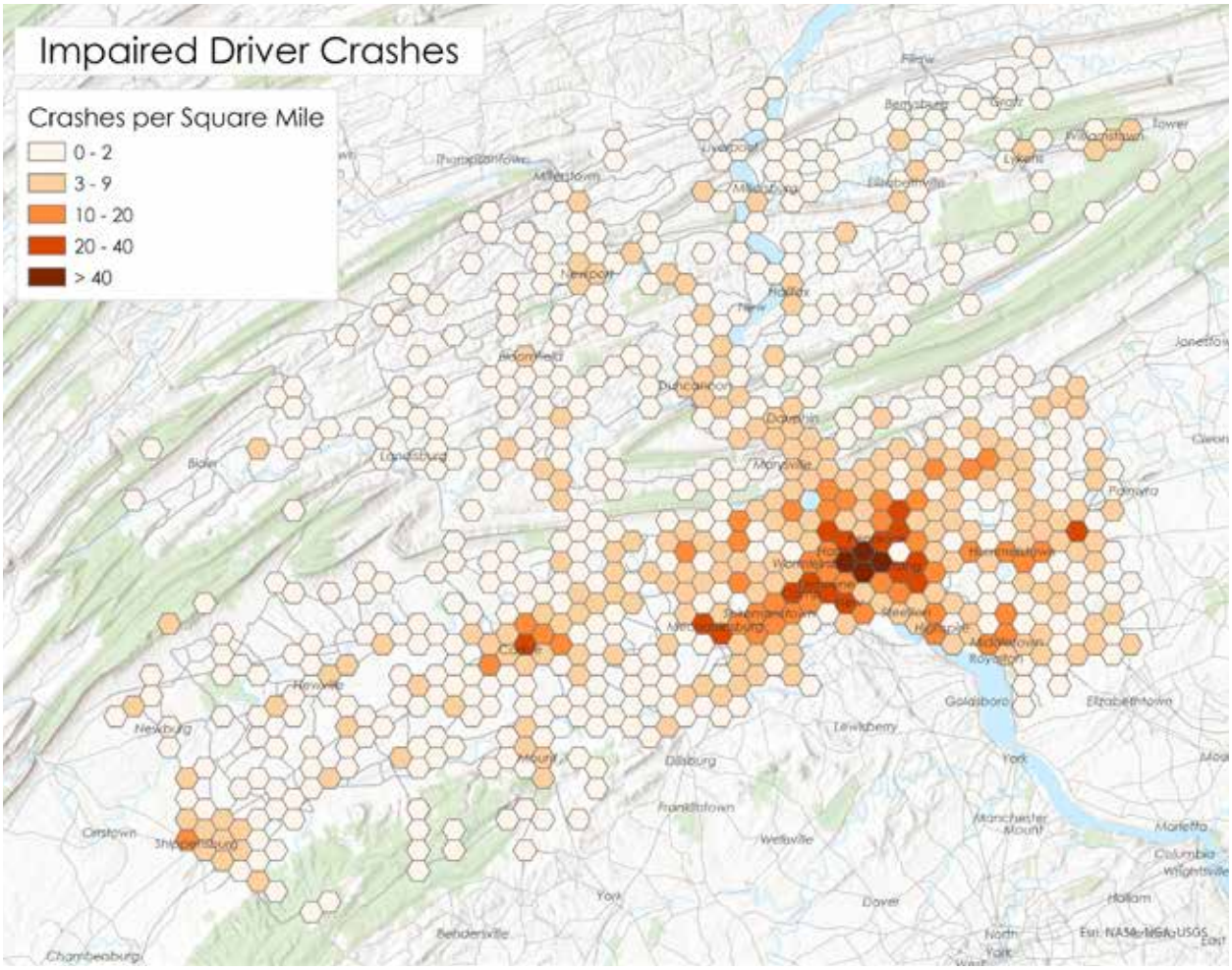
Figure 14. *HATS Impaired Driver Crashes (January 2018 – December 2022)*



Impaired Driving Crash Density

Figure 15 shows the density of impaired driving crashes within a square mile hexagon to add insight on the clusters of crashes for this emphasis area. The highest density of crashes centers on Harrisburg and extends west and east toward Mechanicsburg and Hummelstown, respectively.

Figure 15. *HATS Impaired Driver Crash Density (January 2018 – December 2022)*



Impaired Driving Crashes & Liquor-Licensed Establishments

Because roadway characteristics have little direct influence on impaired driver crashes, this analysis examines liquor-licensed establishments and their proximity to these crashes. Figure 16 displays every impaired driving crash as a dot and every liquor-licensed establishment as a triangle.

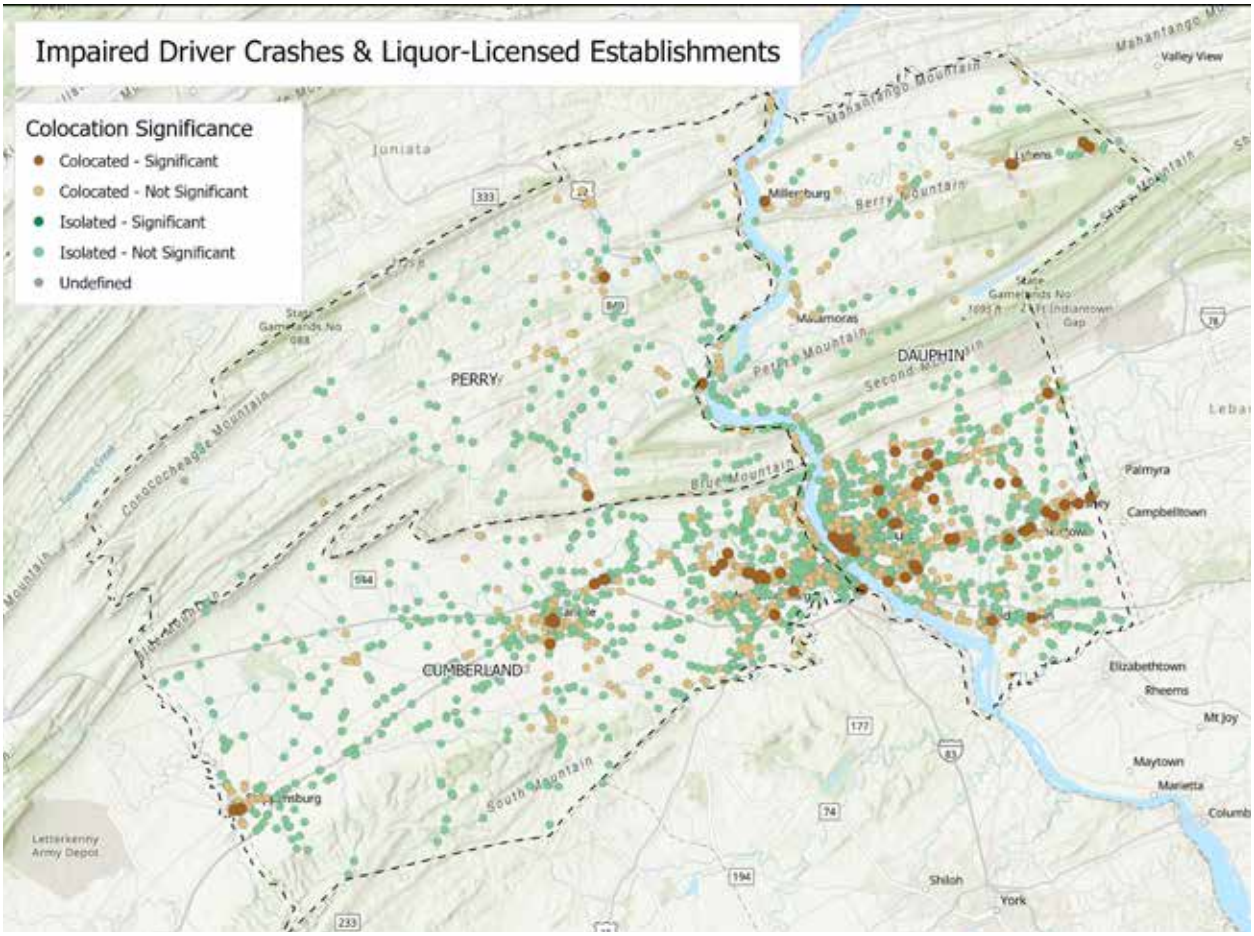
To determine drinking establishment locations, the team gathered an addressed list of liquor licenses from the Pennsylvania Liquor Control Board (PLCB) online database and filtered to those active during the study's timeframe. Establishments that do not allow on-premises

drinking, that sell liquor wholesale, or that host only special occasions like festivals or conventions were excluded.

The colocation analysis with crashes showed that proximity to one or more liquor-licensed establishments was a significant factor in this type of crash. The red and orange dots in Figure 16 signify crashes closer to drinking establishments than green dots. Red dot crashes are not only near purveyors of alcohol, but also within statistically significant proximity to other crashes. Note the geoprocessing tool the team used only considers the direct, geographic distance between crashes and liquor-license holders, not the distance along an established road network.

This analysis helped to determine policy, education, enforcement, and technology countermeasures outlined later in the report. Programs like the Sober Ride Home Pilot Program, Students Against Destructive Driving (SADD), the Underage Drinking Hotline, and sobriety checkpoints can use the colocation analysis to determine where to focus resources efficiently and effectively.

Figure 16. *Colocation Analysis of HATS Impaired Driver Crashes and Liquor-Licensed Establishments (January 2018 – December 2022)*



BICYCLIST AND PEDESTRIAN (OR VULNERABLE ROAD USER) CRASHES

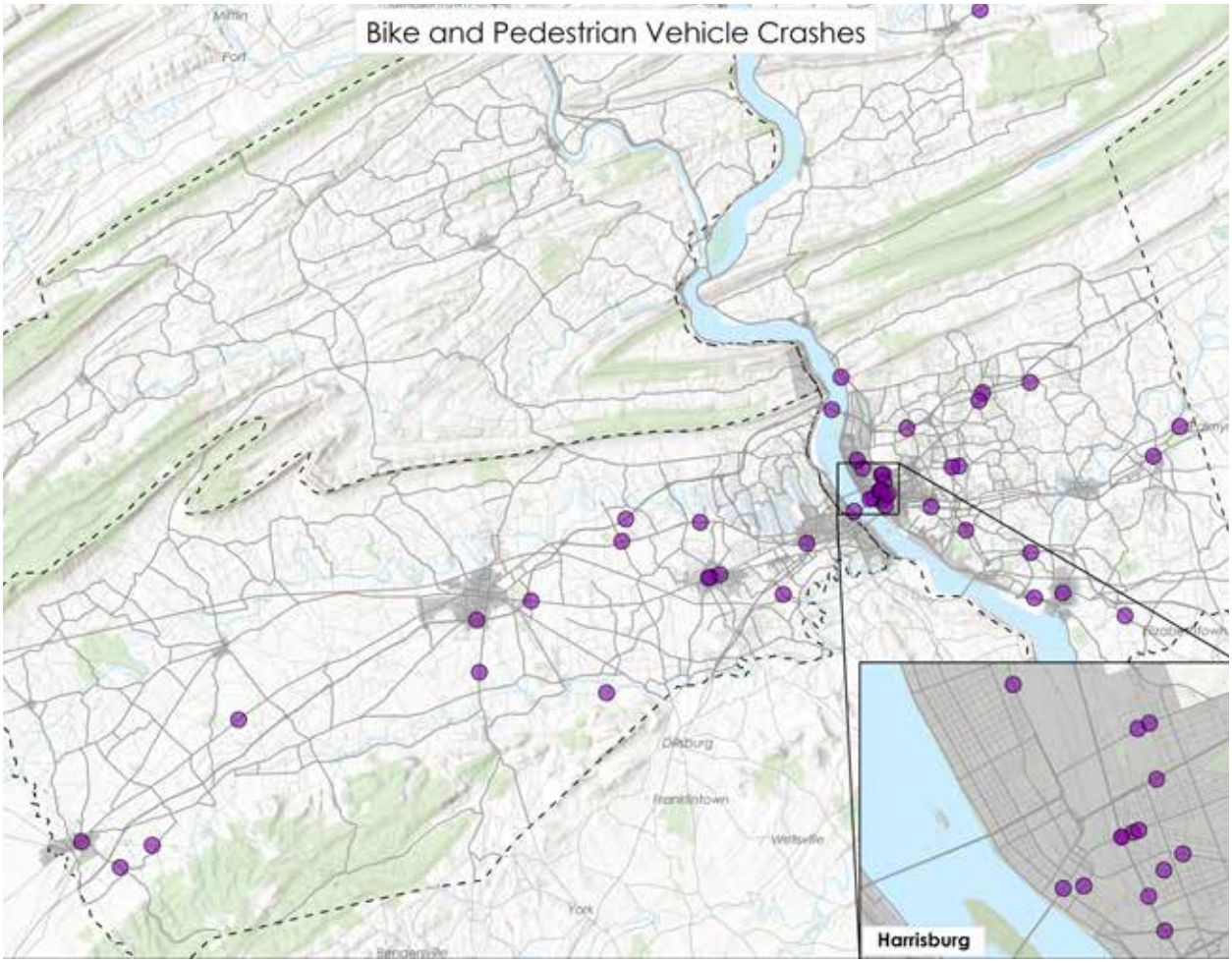
The third emphasis area is crashes involving vulnerable road users. Between 2018 and 2022, the Tri-County Region experienced just under 30,000 vehicle collisions, 3% involving a bicyclist or pedestrian. Although there are fewer crashes involving vulnerable road users compared to other emphasis areas, these crashes are much more likely to result in fatalities or serious injuries. In collisions involving a bicyclist, 21% resulted in a fatal or suspected serious injury, and 26% of pedestrian-involved collisions resulted in the same injury severity. Comparatively, 6% of lane departure crashes and 12% of impaired driver crashes resulted in a fatal or suspected serious injury.

Figure 17 shows an overall data snapshot of bicyclist and pedestrian crashes.

Bicyclist and Pedestrian Safety Crash Mapping

Because most of the region's land uses and infrastructure are car-oriented and bicycle and pedestrian crashes are typically underreported, this emphasis area has the smallest subset of reported crashes. Bicyclist and pedestrian crashes for the Tri-County Region from 2018 to 2022 appear in Figure 17. These crashes were reported primarily within Harrisburg's dense urban center along major roadways.

Figure 17. *HATS Vulnerable Road User Crashes (January 2018 – December 2022)*



High Risk Areas (HRAs)

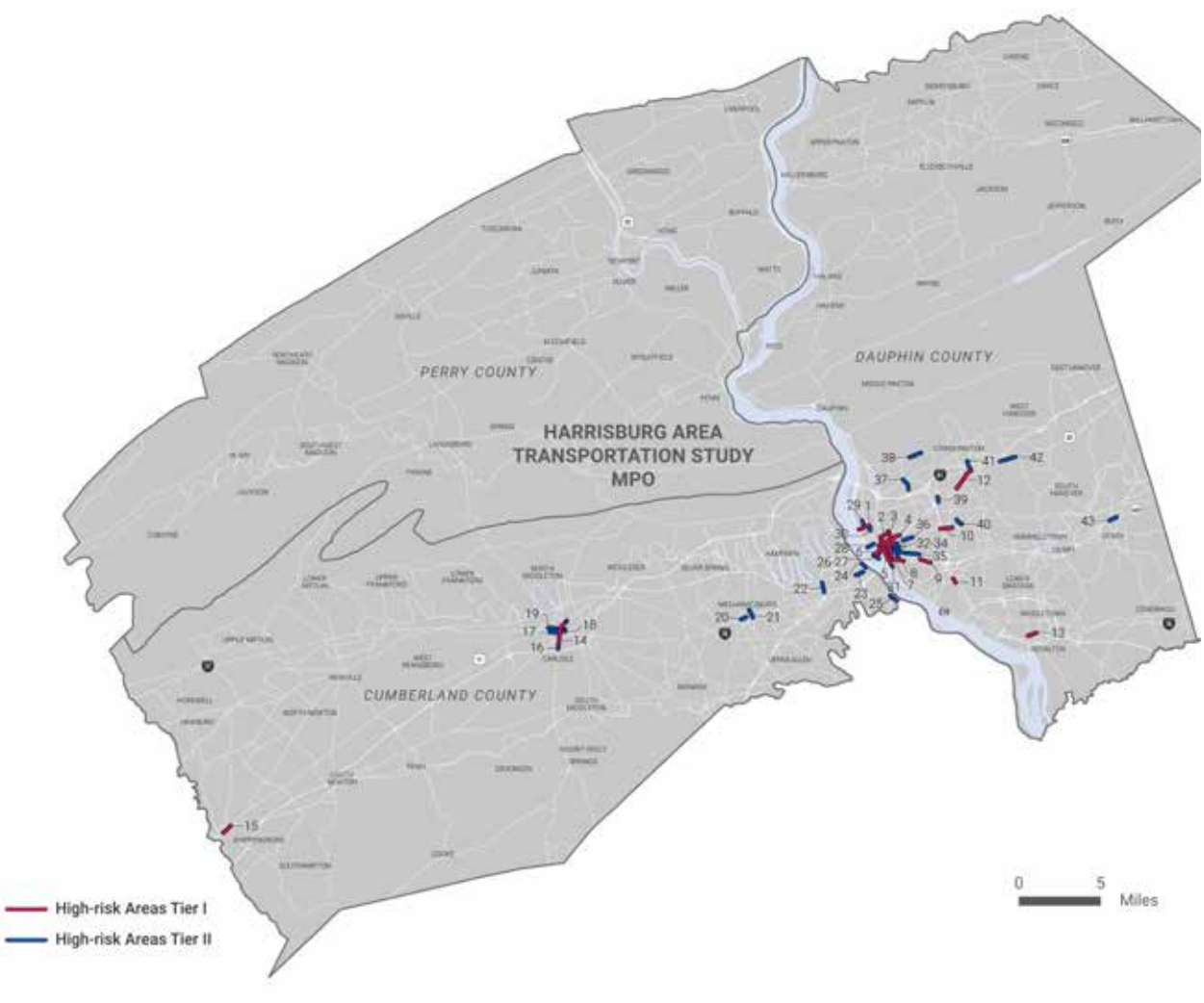
PennDOT's recently published VRU Safety Assessment identifies nearly 200 statewide high-risk areas (HRAs) for fatalities and serious injuries involving people walking or biking. For the sake of this study, HRAs included in the VRU Safety Assessment are considered Tier I priority areas. As shown in Figure 13, there are 15 HRAs within the Tri-County Region, including:

- Eight in Harrisburg
- Two in Swatara Township
- Two in Lower Paxton Township
- One in Middletown
- One in Carlisle
- One in Shippensburg

This assessment was based on an EPDO weighting. Locations with an EPDO score greater than or equal to 40 were identified as Tier I HRAs for the original VRU assessment. An EPDO score greater than or equal to 20 was determined to result in a reasonable number of corridors for further analysis and potential project implementation. Therefore, locations with an EPDO score greater than or equal to 20, but less than 40, were classified as Tier II HRAs.Tier I and Tier II HRAs are shown in Figure 18.

Tier	Map ID	Prefix	Route	Name	From	To
I	1	-	-	Maclay St (D070)	N 2nd St	N 7th St
I	2	PA	3018	Herr St	N Cameron St	N 15th St
I	3	-	-	N 17th St (D083)	Verbeke St	Market St
I	4	PA	3014	State St	N 7th St	Rivington Ter
I	5	PA	230	N Cameron St	Herr St	I-83
I	6	-	-	Market St (D018)	S 2nd St	S 16th St
I	7	-	-	S 13th St (D081)	Market St	Albert St
I	8	PA	3010	Paxton St	S 13th St	S 19th St
I	9	PA	3010	Paxton St	S 29th St	Mall Dr
I	10	PA	3020	Union Deposit Rd	Lakewood Dr	I-83
I	11	PA	441	Eisenhower Blvd	Highland St	Lindle Rd
I	12	US	22	Allentown Blvd/ Jonestown Rd	Park Chester Rd	Mountain Rd
I	13	PA	230	Main St	Race St	Catherine St
I	14	PA	34	Hanover St	Gardner Ave	Ridge St
I	15	US	11	King St	Richwalter St	Prince St
II	16	US/PA	11/34	Hanover St	I-81 WB On-Ramp	Clay St
II	17	US	11	High St	Mooreland Ave	Hanover St

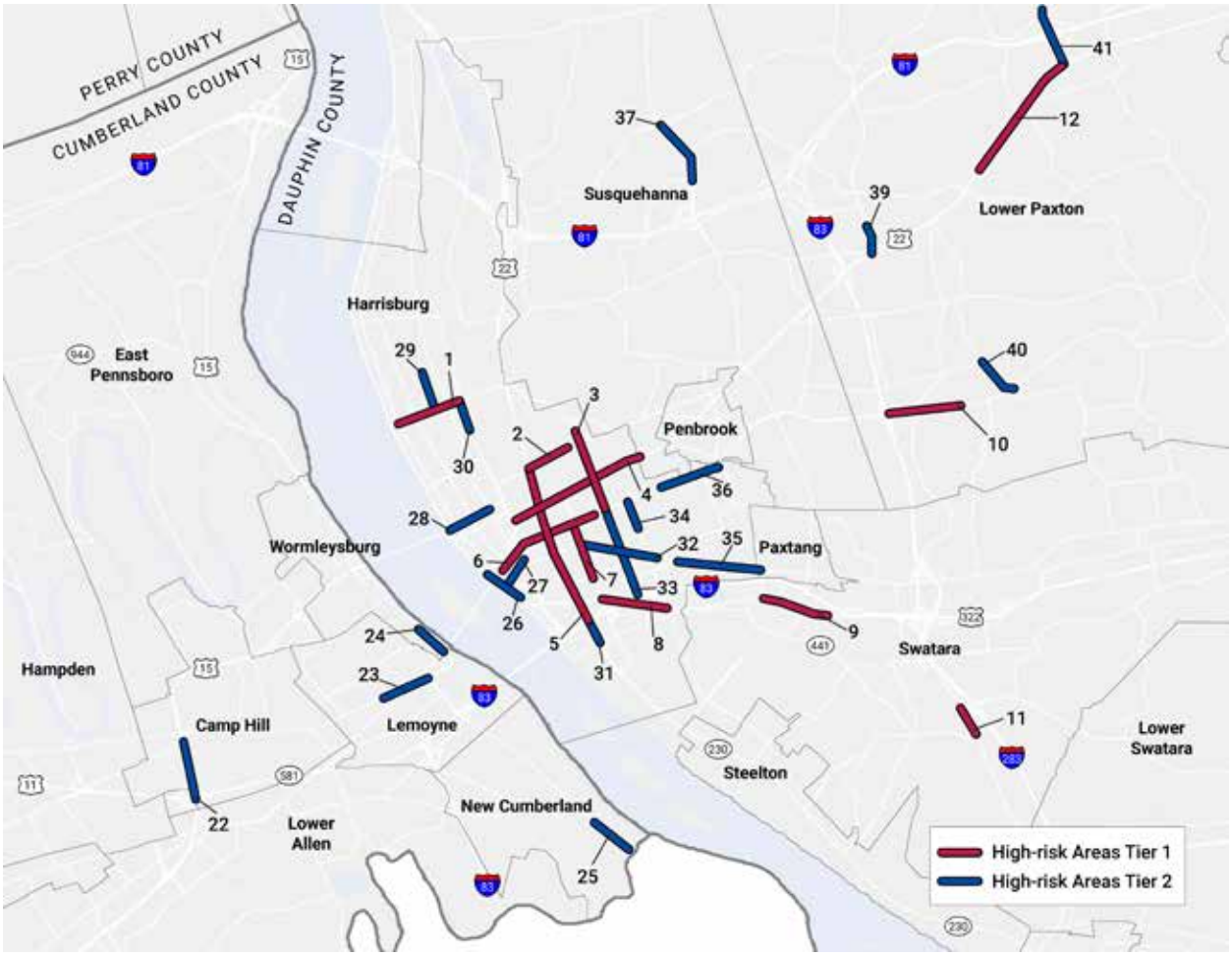
Figure 18. *High Risk Areas (Tier I and Tier II) within HATS*

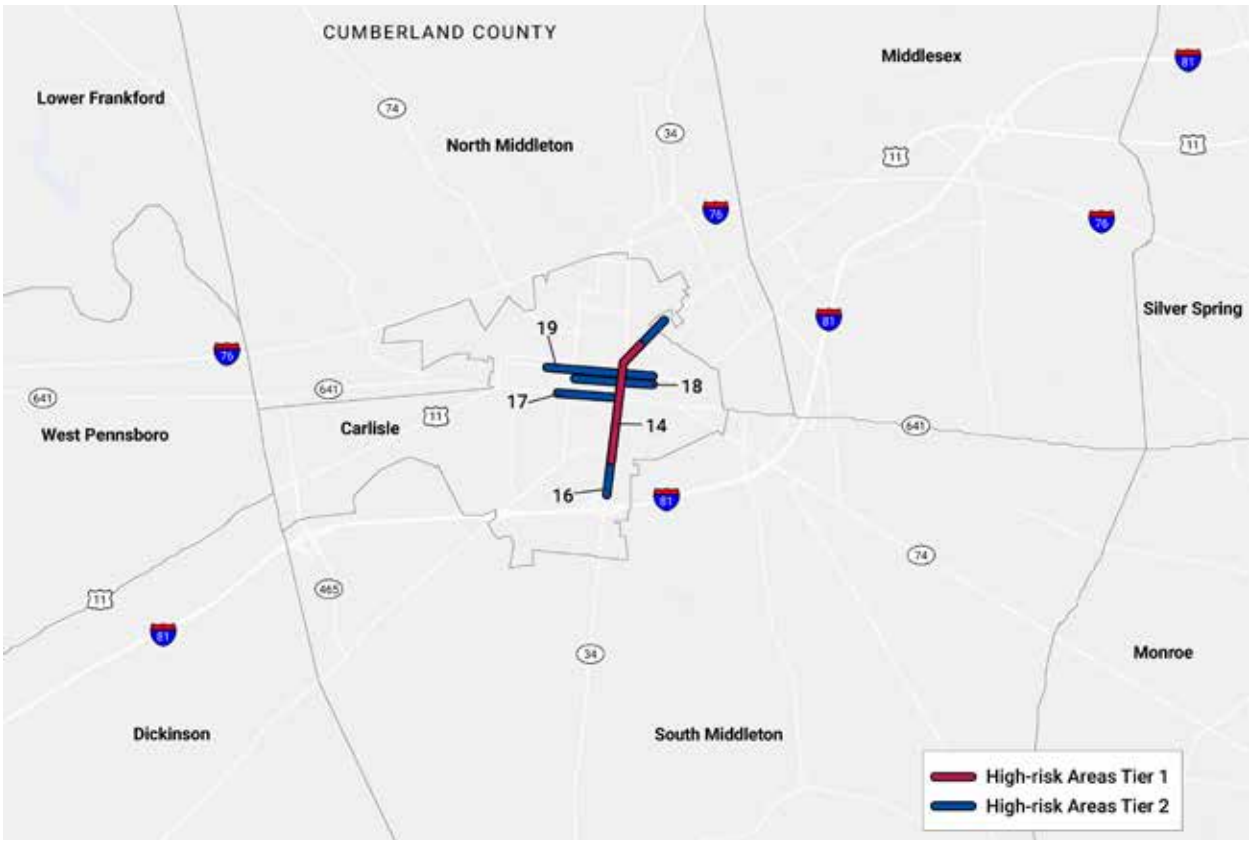


Tier	Map ID	Prefix	Route	Name	From	To
II	18	-	-	Louther St	College St	East St
II	19	-	-	North St (D301)	Cherry St	East St
II	20	PA	114	Main St	York St	Market St
II	21	PA	1011	Walnut St	Simpson St	Brandy Ln
II	22	US	11	32nd St	Harrisburg Expy	Trindle Rd/Chestnut St
II	23	PA	1010	Market St	3rd St	8th St
II	24	PA	1027	Front St	3rd Ave	Market St
II	25	PA	2035	Bridge St	5th St	2nd St
II	26	PA	3009	Front St	Walnut St	Washington St
II	27	-	-	Chestnut St (D082)	Front St	4th St

Table continued on following page.

Tier	Map ID	Prefix	Route	Name	From	To
II	28	PA	3016	Forster St	Front St	Commonwealth Ave
II	29	-	-	N 5th St	Seneca St	Maclay St
II	30	-	-	N 7th St (D071)	Maclay St	Kelker St
II	31	PA	230	Cameron St	Sycamore St	Herr St
II	32	PA	3012	Derry St	S 20th St	S 13th St
II	33	-	-	N 17th St (D083)	Verbeke St	I-83
II	34	-	-	19th St (D089)	Market St	Holly St
II	35	PA	3012	Derry St	S 29th St	S 21st St
II	36	-	-	Market St (D018)	S 25th St	S 22nd St
II	37	PA	3015	Progress Ave	Paxton Church Rd	Kohn Rd
II	38	PA	39	Linglestown Rd	Oakhurst Blvd	Dover Rd/Versailles Dr
II	39	PA	3033	Colonial Rd	Jonestown Rd	King George Dr
II	40	PA	3017	Rutherford Rd	Londonderry Rd	Union Deposit Rd
II	41	PA	3009	Mountain Rd	Lockwillow Ave/Bluebird Ave	Allentown Blvd
II	42	US	22	Allentown Blvd	West Hanover Twp Border	Oak Grove Rd
II	43	US	422	Chocolate Ave	Ridge Rd	Ceylon Ave





See previous page for legend.

Source: Dorret Oosterhoff/Kittelson

COUNTERMEASURES

The project team selected engineering, policy and process, education, enforcement, and technology safety countermeasures with input from the Safety Working Group and overall impressions from public engagement efforts. Countermeasure selection was informed by the high crash, high risk analyses conducted as part of the existing conditions analysis.

Engineering Countermeasures

Engineering countermeasures are physical interventions designed to prevent or mitigate crashes. While not all crashes can be eliminated with engineering countermeasures, improved roadway design has safety benefits for roadway users. These countermeasures are important for creating a safe and sustainable transportation system that supports economic growth and community health.

FHWA has a collection of 28 Proven Safety Countermeasures effective in reducing roadway fatalities and serious injuries. These countermeasures were reviewed for the Tri-County Region and applied to crash emphasis areas as appropriate. Engineering countermeasures were developed to focus on the following areas:

- Lane departures
- Pedestrians and bicyclists
- High Injury Network
- Top PennDOT Highway Safety Network screening sites

Source: Dorret Oosterhoff/Kittelson

Lane Departures

Lane departure crashes are crashes where a vehicle driver crosses over an edge line or center line, or otherwise leaves the roadway. Lane departures into an opposing traffic lane can result in head-on collisions, which are more likely to result in fatalities. According to Pennsylvania crash data, 49 percent of traffic fatalities from 2018 to 2022 in the state involved lane departures. Given the often fatal nature of these crashes, lane departures are an important emphasis area for statewide efforts and for the Tri-County Region.

To better anticipate these crash locations, the project team considered what roadway characteristics are most likely to contribute to a lane departure crash. The analysis for the District Highway Safety Plan indicates these crashes are most common on two-lane rural roads through curves.

TREATMENTS

There are several potential treatments that may be appropriate to mitigate these crashes. These include wider edge lines, rumble strips, chevron signs, and high-friction surface treatment.

Source: Dorret Oosterhoff/Kittelson

Wider Edge Lines

Benefits

- Increase driver's perception of travel lane due to more visible travel lane boundaries
- Relatively low cost
- Prepares for future automated vehicles

Constraints

- Unlit roadways may still experience some nighttime crashes
- Less applicable in city centers

Application Guidance

- Most effective on rural two-lane highways
- Can be utilized on freeways, undivided highways, and multilane divided highways

Design Considerations

- Should be designed with a minimum lane width of 10 feet
- Increase the edge line marking to 4 inches (minimum) to 6 inches (maximum)
- Factors like pavement and shoulder widths, traffic volumes, presence of curves, and history of nighttime crashes should be evaluated

Source: Texas Transportation Institute

Wider edge lines improve drivers' awareness of the travel lane's edge and minimize the likelihood of vehicles veering off the road.

Rumble Strips

Benefits

- Enhanced awareness of the travel lane through noise and vibration
- Low implementation cost

Constraints

- Not for application on Plain Sect travel routes or areas of high bicyclist activity
- Pavement must be in good condition before installation
- Moisture may infiltrate and compromise integrity
- Not applicable in areas with heavy snowfall

Application Guidance

- Pavement factors should consider condition, age, type, thickness, longitudinal joint placement, and the milling equipment utilized
- Carefully identify proper location of rumble strips in relation to pavement markings

Design Considerations

- Dimensions and spacing of rumble strips differ slightly between shoulder rumble strips and center line rumble strips

Source: FHWA

Rumble strips use both noise and vibration to warn the driver when they are veering off the road.

Chevron Signs

Chevron signs alert drivers to upcoming turns and the suitable driving speed.

Benefits

- Increase in driver's perception of upcoming turns as well as direction and speed
- Reduction in night-time crashes for chevron signs with retroreflective strips
- Low implementation cost

Constraints

- Safety concerns on unlit roadways
- Potential knock down of signs in especially tight curves

Application Guidance

- Reference the Manual on Uniform Traffic Control Devices (MUTCD) to provide proper signage placement
- Consider providing on rural highway curves

Design Considerations

- Install at a sufficient height above the road surface
- Use MUTCD Table 2C-5 and 2C-6 guidelines

Source: FHWA

Chevron signs alert drivers to upcoming turns and the suitable driving speed.

High Friction Surface Treatment

Benefits

- Addresses slippery, wet conditions
- Durable and long lasting

Constraints

- Treatment does not address roadway lighting
- Heavy snowfall and black ice can still be a concern

Application Guidance

- Risk factors such as the traffic volume, severity of curve, and severe crash history should be considered
- The treatment can be beneficial on local roads with horizontal curves, interchange ramps, high volume interchange approaches, selected segment of interstate alignment and bridges.

Design Considerations

- A polymer resin binder is utilized to bond the aggregate to the road surface, ensuring exceptional friction levels for an extended period of time

Source: FHWA

High friction surface treatments are pavement treatments that decrease the number of accidents, injuries, and deaths related to issues with decreased pavement friction in wet conditions, higher speeds, and road geometrics.

LOCATIONS

Along a given roadway segment, factors like number of curves, angle of curve, radius, traffic volume, and pavement width contribute to the potential for a lane departure. Using this information, the project team conducted a systemic analysis of two-lane rural roads to identify prioritized locations for lane departure treatments. The top 50 locations were listed and reviewed to determine which treatments may be appropriate for each location. Field review was conducted to determine appropriate countermeasures and data on Plain Sect routes were overlaid to ensure rumble strips are not used in those communities. It has been found that rumble strips can injure horses, thereby limiting horse-and-buggy travel for Amish, Mennonite, and other Plain Sects. The top 50 locations and possible treatments are listed in the Existing Conditions section of this report.

Pedestrians and Bicyclists

Crashes involving a pedestrian or bicyclist, while more rare than other crash types, are more likely to result in serious injury or death. According to Pennsylvania's VRU Safety Assessment Report, pedestrians and bicyclists were involved in four percent of all statewide crashes from 2015-2019 but made up about 15 percent of all fatalities. Given their often fatal nature, pedestrian and bicyclist crashes are an important emphasis area for statewide efforts and for the Tri-County Region.

As noted in the "Existing Conditions" section of this plan, the statewide Pennsylvania VRU Safety Assessment Report and methodology were used to identify potential treatment locations.

TREATMENTS

There are several potential treatments that may be appropriate to mitigate VRU crashes. Treatments are discussed in more detail below, including appropriate contexts for use, general benefits, constraints, typical applications, and design considerations.

Application of these countermeasures is typically site-specific and requires a level of detail that cannot be addressed by a regional Safety Action Plan for the 43 identified Tier I and Tier II High Risk Areas. The project team recommends that local jurisdictions, HATS, and PennDOT work together to identify countermeasures appropriate to each site's context.

Source: Dorret Oosterhoff/Kittelson

Shared Use Path

Benefits

- Combined facility for bicyclists and pedestrians
- Provides separation from vehicle traffic
- Designed for all ages and abilities

Constraints

- Requires substantial buffer to separate from roadways
- Unlit paths may not be comfortable for users
- Potential conflicts with vehicle or other crossings

Application Guidance

- Links between communities that also serve as recreational facilities
- Parallel alternative route to roads in areas where sidewalks or on-street facilities are not provided
- Easiest to accommodate in areas where more right of way is available, so downtown applications are uncommon

Design Considerations

- Best for areas where crossings can be minimized, and high-visibility treatments applied where there are crossings
- Generally should be designed with a minimum width of 10 feet

Source: East Coast Greenway

A **shared use path** is an off-road facility that provides the highest level of separation and the lowest level of traffic stress for cyclists. It is designed for use by people of all ages and abilities walking and bicycling.

Raised Bike Lane

Benefits

- Separates bicyclists from vehicle traffic, which can attract more bicyclists
- Better for winter maintenance and plowing

Constraints

- Existing right of way width
- Additional construction may be required to move curbs

Application Guidance

- Links with adequate right of way and/or where curb reconstruction is being done
- Critical bike network segments where additional protection is warranted

Design Considerations

- Intersections should be designed for visibility of bicyclists and may warrant separate signal phasing depending on context.
- Buffer type varies depending on application, presence of parking, and available right of way

Source: NACTO, Raised Cycle Tracks

A **raised bike lane**, also known as a raised cycle track, is a bicycle facility located between sidewalk and roadway level instead of within the roadway.

One-Way Separated Bike Lane

Benefits

- Separates bikes from vehicle traffic, which can attract bicyclists
- Less chance of "dooring"—opening the door of a parked car into a bicyclist—when parked cars are present

Constraints

- Winter maintenance and plowing
- Existing roadway width
- Planters or curbs can increase construction costs compared to a standard bike lane

Application Guidance

- Links with adequate right of way or where a road diet can be implemented
- Critical bike network segments where additional protection is warranted

Design Considerations

- Intersections should be designed for visibility of bicyclists and may warrant separate signal phasing depending on context
- Buffer type varies depending on application, presence of parking, and available right of way
- Current PennDOT guidance does not permit parking-separated bike lanes without a curbed buffer

Source: Aditya Inamdar, Kittelson

A **one-way separated bike lane**, also known as a one-way protected cycle track, is a bicycle facility within the street right of way separated from vehicle traffic by a physical barrier such as planters, flexible posts, parked cars, or curb.

Two-Way Separated Bike Lane

Benefits

- Reduces right of way need compared to two one-way separated bike lanes
- Provides separation from vehicle traffic
- Less chance of "dooring"—opening the door of a parked car into a bicyclist—when parked cars are present

Constraints

- May be less intuitive for users with "wrong way" travel on one side of street
- Potential conflicts with vehicle or other crossings
- Planters or curbs can increase construction costs compared to a standard bike lane

Application Guidance

- Connections between shared use paths
- Critical bike network segments where additional protection is warranted

Design Considerations

- Buffer type varies depending on application, presence of parking, and available right of way
- Current PennDOT guidance does not permit parking separated bike lanes without a curbed buffer

Source: Tara Hofferth, Kittelson

A **two-way separated bike lane**, also known as a two-way protected cycle track, is a bicycle facility within the street right of way separated from vehicle traffic by a physical barrier such as planters, flexible posts, parked cars, or curb. Two-way separated bike lanes serve bidirectional bicycle travel on one side of the street.

Buffered Bike Lane

Benefits

- Less chance of "dooring"—opening the door of a parked car into a bicyclist—when parked cars are present
- Added separation from vehicles

Constraints

- Does not provide physical protection
- Drivers may use additional buffer width as parking or standing zone

Application Guidance

- Links with moderate vehicle speeds or volumes
- Streets with adequate right of way to provide a buffer
- Important links within and between communities

Design Considerations

- Buffer may consist of diagonal striping or rumble strips to deter drivers from using the buffer space

Source: NACTO, Buffered Bike Lanes

Buffered bike lanes are on-street lanes that include an additional striped buffer of typically 2-3 feet.

Standard Bike Lane

A standard bike lane is an on-street facility that provides space reserved for bicyclists, delineated with pavement markings.

Benefits

- Provides a designated space for people biking
- Increases visibility for people biking
- Inexpensive treatment when width is available

Constraints

- Greater chance of "dooring"—opening the door of a parked car into a bicyclist
- Does not provide physical protection
- Drivers may use additional width as parking or standing zone

Application Guidance

- Streets without sufficient right of way or pavement width to provide buffered or separated bike lanes

Design Considerations

- Bike lane width is typically 6 feet but can be reduced to 4 feet in constrained locations where parking is not present
- Striping can add visibility and awareness at intersections

Source: Tara Hofferth, Kittelson

A **standard bike lane** is an on-street facility that provides space reserved for bicyclists, delineated with pavement markings.

Pavement Markings Through Intersections

Benefits

- Increases driver awareness of people biking
- Aids bicyclists in knowing where to cross

Constraints

- May require additional maintenance due to vehicles crossing pavement markings more frequently

Application Guidance

- Intersections and conflict zones

Design Considerations

- White dashed lines should be used at a minimum to extend a bike lane through an intersection or across a conflict zone
- Dashed green pavement can enhance driver awareness and bicyclist visibility

Source: NACTO, Intersection Crossing Markings

Pavement markings through intersections are green paint that can be used in "conflict zones" where vehicle drivers and bicyclists may cross. This is an additional treatment for bike lanes.

Road Diet

Benefits

- Calms vehicle speeds
- Reallocates space for bike lanes and pedestrian paths
- Provides vehicular access to commercial and business driveways

Constraints

- Depending on roadway capacity, may increase travel time
- Transit vehicles may block through traffic when stopped

Application Guidance

- Four-lane undivided roadways, which are converted to roadways with one lane in each direction and a two-way center left-turn lane

Design Considerations

- Can be implemented with resurfacing projects to incorporate a road diet at minimal additional cost
- Most common on roadways with annual average daily traffic (AADT) less than 20,000, though some road diets have been implemented with higher traffic volumes

Source: FHWA Proven Safety Countermeasures

A **road diet** reduces the number of vehicle travel lanes on a roadway to manage driver speeds, reduce crash risk, and provide additional multimodal facilities.

Sidewalk

Benefits

- Provides separation from vehicle traffic
- Provides means of mobility for people using wheelchairs, strollers, or others who may not be able to travel on an unpaved surface

Constraints

- Retrofitting sidewalks along roadways that do not currently have them may require additional right of way

Application Guidance

- Most streets, with the exception of limited-access freeways
- Typically added to areas as redevelopment occurs

Design Considerations

- Widths may vary from 6 to 8 feet (or even more in downtown areas), with a minimum of 5 feet required in most cases
- Landscaped buffer or wider sidewalks may be desirable depending on surrounding land use context

Source: NACTO

A **sidewalk** is a dedicated pedestrian facility adjacent to the roadway and separated from traffic by a curb. Sidewalks may also have an additional buffer zone between the roadway and the walking area.

Crosswalk Lighting

Benefits

- Improves the visibility of people crossing the street
- Enhances drivers' sight distance
- Encourages foot traffic and can make local establishments feel inviting

Constraints

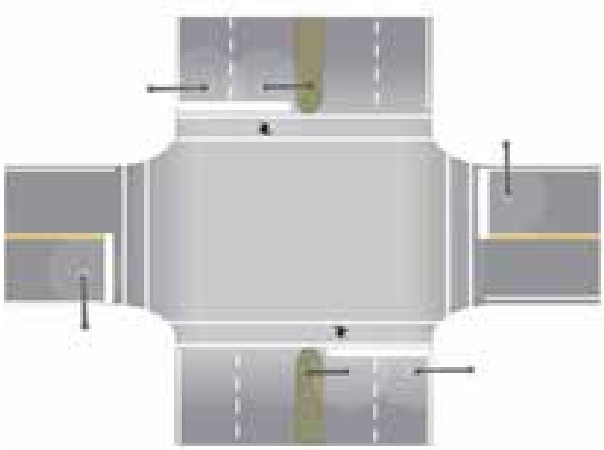
- Requires space in potentially busy areas, such as sidewalks or intersections

Application Guidance

- Areas of high pedestrian traffic, such as bus stations, shopping centers, schools, and shared use paths
- Corridors with commercial activity

Design Considerations

- Lighting should not be placed to block entrances or inhibit pedestrian flow
- Size and type of light fixture may vary depending on the surrounding context and available space



Source: FHWA Informational Report on Lighting Design for Midblock Crosswalks

Crosswalk lighting is additional illumination provided at locations to make drivers more aware of people in crosswalks.

High-Visibility Crosswalk

High visibility crosswalks are reflective roadway markings that may be accompanied by signage at intersections and priority pedestrian crossing locations.

Benefits

- Makes drivers aware that people may be crossing
- Requires motorists to stop for people walking in crosswalk
- Relatively low cost

Constraints

- Compliance not as high at uncontrolled locations compared to other treatments
- Most effective with other types of traffic control

Application Guidance

- Intersections of vehicle facilities with moderate to high vehicle volumes and speeds
- Mid-block locations, particularly when implemented with other treatments

Design Considerations

- Minimum width is 6 feet, but wider crossings may be preferred in areas with a high number of people walking

Source: NACTO

High visibility crosswalks are reflective roadway markings that may be accompanied by signage at intersections and priority pedestrian crossing locations.

Median Island for Pedestrian Crossing

Benefits

- Reduces exposure of people walking
- Requires shorter gaps in traffic to cross street
- Allows people to cross in two stages

Constraints

- Available right of way or existing pavement width may not provide adequate space to add a median island

Application Guidance

- Mid-block for areas with large distances between crossings
- Intersections with high traffic volumes or with a notable crash history

Design Considerations

- Must have 6 feet of clear width to accommodate people in wheelchairs
- Can be applied with other treatments

Source: NACTO

A **median island for pedestrian crossing** is a protected area in the middle of a crosswalk where people walking can pause before crossing the rest of the street.

Leading Pedestrian Interval

Benefits

- Reduces pedestrian crossing time
- Increases pedestrian visibility
- Reduces pedestrian-vehicle crashes by 13%[3]

Constraints

- Only implemented at signals with concurrent phasing
- Reduces green time for vehicles
- May increase delays at intersections that are at capacity

Application Guidance

- Intersections where right-turning vehicles do not yield to pedestrians
- Intersections with a history of vehicle-pedestrian crashes

Design Considerations

- Pedestrian signal faces must be provided
- Interval should be 3-7 seconds

Source: FHWA Safety Evaluation of Leading Pedestrian Intervals on Pedestrian Safety

A **leading pedestrian interval** is a signal modification that allows pedestrians a head start to cross before same-direction drivers are given a green light. It is intended to reduce potential conflicts between drivers and pedestrians at the end of the signal cycle.

3 Goughnour, E., D. Carter, C. Lyon, B. Persaud, B. Lan, P. Chun, I. Hamilton, and K. Signor. "Safety Evaluation of Protected Left-Turn Phasing and Leading Pedestrian Intervals on Pedestrian Safety." Report No. FHWA-HRT-18-044. Federal Highway Administration. (October 2018)

Curb Extension

Benefits

- Shortens crossing distances
- Reduces vehicular turning speeds
- Increases visibility between people driving and walking

Constraints

- Can only be used on streets with on-street parking or excess travel lane width
- Greater cost to install than standard crosswalks
- May conflict with dedicated transit lanes

Application Guidance

- Mid-block or intersection pedestrian crossings or transit stops
- Streets where on-street parking is provided

Design Considerations

- Design vehicle for determining radius
- Provide accessible curb ramps and detectable warnings

Source: NACTO

A **curb extension** extends the sidewalk into the street, usually at an intersection. It narrows the vehicle travel way, inhibits fast turns, and shortens crossing distance for people walking.

Pedestrian Countdown Signal Head

Benefits

- Instructs pedestrians when to cross
- Encourages more pedestrians to use push buttons

Constraints

- Only implemented at signalized intersections

Application Guidance

- Intersections with pedestrian activity or adjacent land uses
- Intersections where no pedestrian facilities are provided

Design Considerations

- Calculations must be completed for walk and flash don't walk intervals
- May require retiming if existing signal phasing does not provide adequate time for crossing

Source: FHWA Signalized Intersections Informational Guide

A **pedestrian countdown signal head** pairs a standard pedestrian signal head with an added display showing the remaining crossing time.

Rapid Rectangular Flashing Beacon (RRFB)

Benefits

- Provides a visible warning to drivers at eye level
- Increases driver yielding behavior at crossings by up to 98%[4]
- Allows drivers to proceed after yielding

Constraints

- Must be activated by people walking or biking
- Driver compliance may be lower than when compared with a traffic signal

Application Guidance

- Mid-block crossings with high pedestrian or bicycle demand and high traffic volumes
- Crossing treatment for shared use paths

Design Considerations

- Push button placement should be easily accessible to people walking, in wheelchairs, or on bicycles
- Can be added in median island for multi lane crossings

Source: LJB

A **Rapid Rectangular Flashing Beacon (RRFB)** includes signs that have a pedestrian-activated flashing light to attract driver attention and raise driver awareness of people walking or biking crossing the roadway.

4 Fitzpatrick et al. "Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon." Report No. TTI-CTS-0010. Texas A&M Transportation Institute, (2016).

Road Safety Audit, Source: FHWA

LOCATIONS

As noted in the “Existing Conditions” section of this plan, high-risk areas were identified using the methodology established in Pennsylvania’s VRU Safety Assessment Report. Tier I locations are those that received higher scores in the VRU Safety Assessment Report. Tier II locations received more moderate scores from the VRU analysis. Tier I and Tier II locations are recommended to receive treatments outlined above for pedestrians and bicyclists.

High Injury Network

The High Injury Network (HIN) shows where the highest concentration of traffic deaths and serious injuries has occurred over the past five years. This ranked list of corridors will help TCRPC prioritize the deployment of countermeasures for each location.

TREATMENTS

As the HIN is based on crash severity and not crash type, it is important for TCRPC to consider a more extensive suite of treatments for HIN segments. Road safety audits allow for a more thorough, context-sensitive evaluation for each identified corridor. According to FHWA, a road safety audit is a "formal safety performance evaluation of an existing or future road or intersection by an independent, multidisciplinary team." The road safety audit is the first-line recommended countermeasure for HIN corridors.

LOCATIONS

HIN segments were identified using methodologies outlined in the *Highway Safety Manual (HSM)* and described in the Existing Conditions section of this report. The resulting corridors are appropriate candidates for road safety audits.

Through coordination with the Safety Working Group, several additional sites were identified for road safety audits. These include:

- Walnut Bottom from S. West Street to Garland Drive (Carlisle)
- High Street from Orange Street to Otto Avenue (Carlisle)
- Linglestown Road from Allentown Boulevard to Devonshire Road (West Hanover Township)
- Manor Drive from Allentown Boulevard to Sandy Hollow to Piketown (West Hanover Township)

New sites were also identified for demonstration projects. These include:

- Prince Street and Jonestown Road (Lower Paxton)
- Prince Street (Lower Paxton)
- Main Street between Ann Street and Wood Street (Middletown Borough)
- Main Street and Vine Street (Middletown Borough)
- Derry Street between 44th Street and 50th Street (Swatara Township)
- 28th Street and Sycamore Street (Swatara Township)
- Chambers Hill Road and Keckler Road (Swatara Township)
- 80th Street (Swatara Township)
- SR 39 from north of I-81 to south of SR 22 (West Hanover Township)

Continued on next page.

LOCATIONS (continued)

- Camp Hill Bypass (Camp Hill Borough)
- Bridge Street (New Cumberland Borough)
- 6th Street south of Linglestown Road (Susquehanna Township)
- Wood Street between Schoolhouse Lane and Union Deposit Road (Susquehanna Township)
- Crooked Hill Road/Continental Drive north and south of Linglestown Road (Susquehanna Township)
- Walnut Bottom Road and Mooreland Avenue and Noble Boulevard (Carlisle Borough)
- College Street and Pomfret Street (Carlisle Borough)
- College Street and South Street (Carlisle Borough)
- West Street and E Street (Carlisle Borough)
- West Street and F Street (Carlisle Borough)
- West Street and H Street (Carlisle Borough)
- South Street and Parker Street (Carlisle Borough)
- Meeting House Spring Road and Forbes Road (Carlisle Borough)
- Wilson Street and Hillside Drive (Carlisle Borough)
- Bedford Street and East Street and Henderson Street (Carlisle Borough)
- Belvedere Street from High Street to Walnut Bottom Road (Carlisle Borough)
- South Street from Orange Street to Parker Street (Carlisle Borough)
- Louther Street and Porter Avenue (Carlisle Borough)
- Pitt Street and Ridge Street (Carlisle Borough)

Source: Mr. Matté/Wikimedia Commons

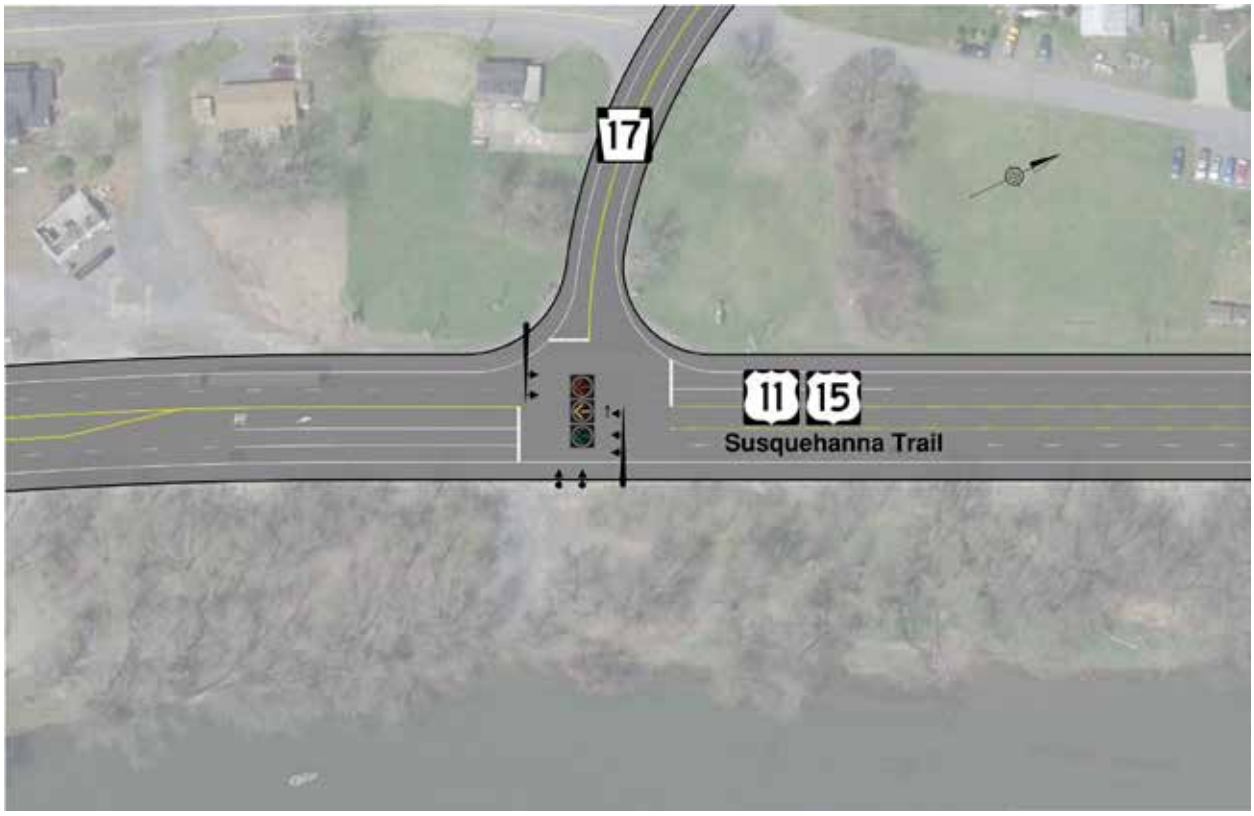
TOP PENNDOT HIGHWAY SAFETY NETWORK SCREENING SITES

PennDOT regularly updates a list of intersections in need of safety improvements for each county in the state. This list is generated using HSM methodology to compare reported crash data against how many crashes are expected to occur at an intersection. A comparison of these two metrics allows PennDOT to determine where more crashes occur than would be predicted using safety performance functions.

Five Highest-Priority Location Concepts

The project team determined high-priority locations for each county by reviewing PennDOT's latest Highway Safety Network Screening list and eliminating locations where improvements are either planned or were recently constructed. Two resulting locations each were identified for Dauphin and Cumberland counties and one location for Perry County. One location, Walnut St at 28th St and Penbrook Ave, overlaps with the High Injury Network.

Conceptual engineering countermeasures were identified for each site. Note that any final recommendations will need to have the appropriate traffic engineering and safety studies performed and be formally reviewed and approved by PennDOT District staff.



Signalization concept for US 11 and PA 17 intersection

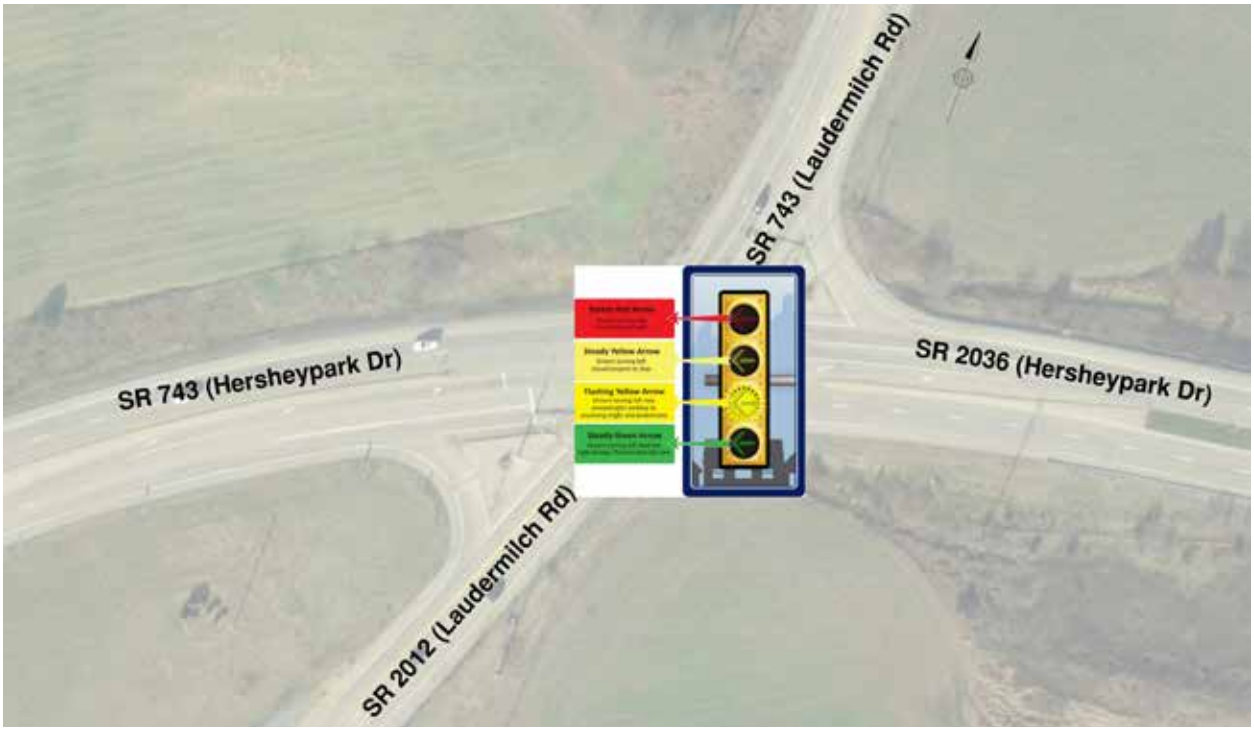
US 11 and PA 17 – Perry County

The priority location selected for Perry County was the intersection of US 11 (Susquehanna Trail) and PA 17 in Liverpool Borough. Current safety issues include speeds and the relative isolation of the intersection, leading to drivers not expecting conflicting traffic. There is also a history of angle crashes to and from PA 17.

The existing intersection is constrained by the Susquehanna River to the east. In developing concepts, multiple intersection forms were considered. These included a roundabout, restricted crossing U-turn, median U-turn, grade separated interchange, and signalized intersection.

It appears that a signal would be the most beneficial alternative from a safety and cost perspective, specifically due to right-of-way costs for the other alternatives. Implementing protected/prohibited left-turn phasing on US 11 is recommended. Based on information from Crash Modification Factors, these improvements could reduce left turn crashes by 77 percent.

This concept will require additional analysis. Based on available data, this location may not meet necessary signal warrants based on traffic volume, but the signal may be warranted due to crash history.



Signalization concept for US 11 and PA 17 intersection

Hersheypark Dr and Laudermilch Rd – Dauphin County

One of the priority locations selected for Dauphin County is the intersection of Hersheypark Dr and Laudermilch Rd in Derry Township. Current safety issues include angle crashes, conflicts with protected/permitted left turns, and wildlife or roadside object conflicts. Crash history includes 23 crashes from 2018-2022, with 18 being left turn crashes.

The phasing operations of the existing signal, which includes protected/permitted left turns, may be a contributing factor to the frequent left turn angle crashes. The project team considered a tiered approach to improvements, with easier and lower-cost treatments being implemented first and evaluated before pursuing more extensive changes.

The first recommendation is to implement a flashing yellow arrow for the existing left turn phases. Based on information from Crash Modification Factors, this improvement could reduce left turn crashes by 16 percent.

Flashing yellow arrow (first recommendation) concept for Hersheypark Dr and Laudermilch Rd intersection

If this improvement does not produce a noticeable benefit, the second recommendation is to implement protected phasing for left turns. Based on information from Crash Modification Factors, this improvement could reduce left turn crashes by 99 percent.

If signal modifications are found to be insufficient to eliminate the crashes at this location, elimination of all turn conflicts could be accomplished by converting the intersection to a multilane roundabout, which is also likely to reduce all other crash types with the exception of property damage sideswipes and rear-end crashes. This improvement could reduce all crashes by 60 percent.

Road diet and geometric configuration for Walnut St and 28th St and Penbrook Ave intersection

Walnut St and 28th St and Penbrook Ave – Dauphin County

The other priority location selected for Dauphin County was the intersection of Walnut St at 28th St and Penbrook Ave in Penbrook Borough. Current safety issues include skewed intersection geometry, a lack of bicycle facilities, and long pedestrian crossings. Angle, rear-end, head-on, sideswipe, and pedestrian/bicycle crashes have occurred at this location. A total of 51 crashes have occurred near this intersection from 2019-2023.

Based on available traffic volume data at this intersection and adjacent segments, Walnut Street through this intersection is an ideal candidate for a four-lane to three-lane road diet conversion. Walnut Street currently has an average daily traffic volume of 8,700 vehicles.

A road diet would address many crash types at the intersection with the reduction of conflict points and dedicated left turn lane. Based on information from Crash Modification Factors, this improvement could reduce all crashes by 29 percent.

In addition to the road diet, the concept also includes curb extensions and minor road realignments to slow turning speeds and reduce crossing distances for pedestrians. This will also improve safety at the intersection, in particular for pedestrians and bicyclists.

This location would benefit from a road safety audit and evaluation of road diet feasibility for the length of Walnut Street, from Parkway Drive to the I-83 interchange.

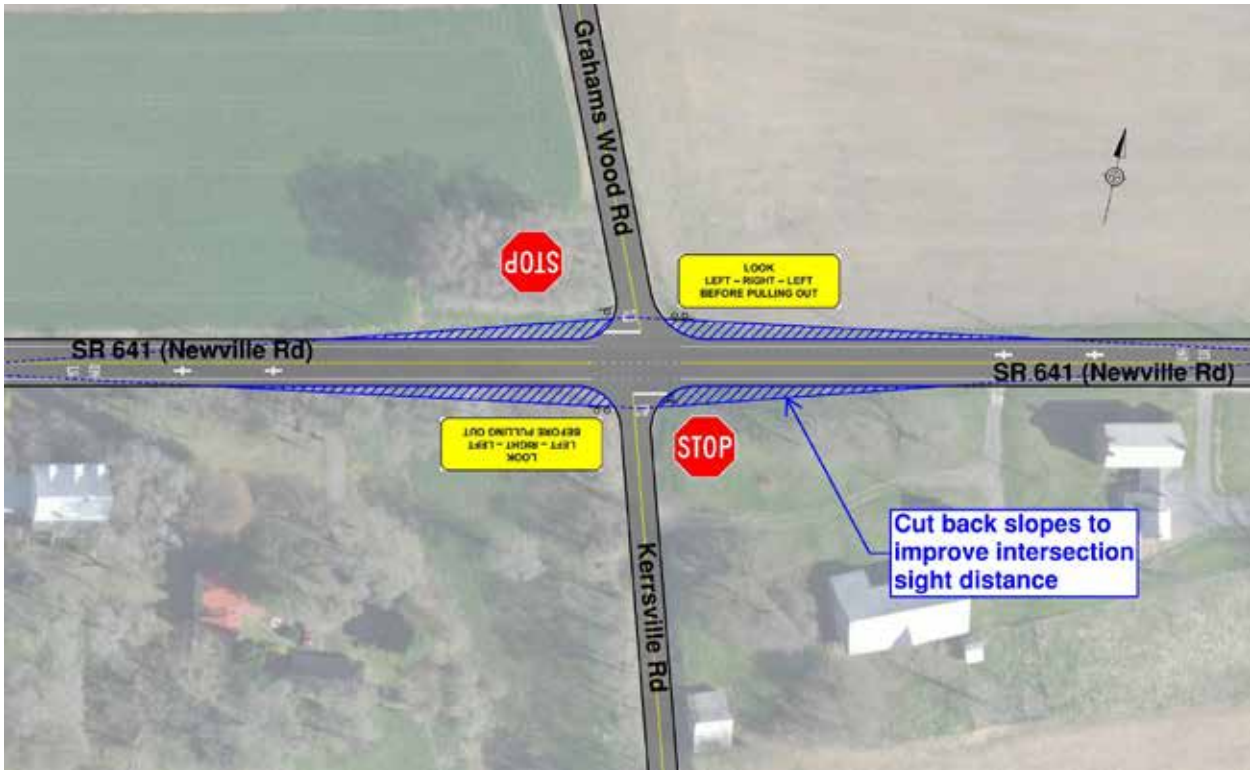
All-way stop control for Park Dr and Petersburg Rd intersection

Park Dr and Petersburg Rd – Cumberland County

One of the priority locations selected for Cumberland County was the intersection of Park Dr and Petersburg Rd in South Middleton Township. The intersection currently operates with stop control on the Petersburg Rd approaches and free flow on Park Dr. Current safety issues include skewed geometry, lack of pedestrian crossings, and high speeds and long distances without stopping on Park Dr. Crash history includes nine crashes observed from 2018-2022.

The most common crash cause at this intersection is proceeding without clearance. This may be exacerbated by the presence of large trees on the western corner of the intersection that may reduce sight distance for southbound traffic on Petersburg Rd. To mitigate this, the project team recommends that all-way stop control be further studied for the intersection. Based on information from Crash Modification Factors, this improvement could reduce all crashes by 48 percent.

Considering the Township's municipal building is located adjacent to the intersection and may attract foot traffic, crosswalks are also recommended for this location.



Signing and pavement marking improvements and sight distance improvements for Newville Rd and Kerrsville Rd intersection

Newville Rd and Kerrsville Rd – Cumberland County

The other priority location selected for Cumberland County was the intersection of Newville Rd and Kerrsville Rd in West Pennsboro Township. Current safety issues include lack of stop lines and high speeds and long distances without stopping on Newville Rd.

Half of the crashes at the intersection were angle crashes with the main cause being drivers running stop signs or proceeding without clearance. To mitigate this, the project team recommends adding intersection warning treatments, including signing and pavement marking improvements. Based on information from Crash Modification Factors, this improvement could reduce all crashes by 25 percent. To address sight distance issues, the project team recommends cutting back slopes to improve intersection sight distance. Based on information from Crash Modification Factors, this improvement could reduce all crashes by 35 percent.

Source: w_lemay/Wikimedia Commons

Policy & Process Countermeasures

Policy and process countermeasures are the principles established by leaders and actions taken by organizations to prevent or mitigate crashes on roadways. One important example of a policy countermeasure is the commitment made by elected officials or governing bodies to eventually eliminate serious injuries and fatalities on their roadways. This commitment was already made by the HATS Coordinating Committee in January 2020.

To build on this commitment, the project team proposes two countermeasures: a Sober Ride Home Pilot Program and future meetings of the Safety Working Group.

Sober Ride Home Pilot Program

The Sober Ride Home Pilot Program was developed in conjunction with partner organizations from the Safety Working Group. The program would deliver an easily accessible and cost-effective rideshare alternative to driving under the influence, targeting patrons of businesses serving alcoholic beverages. TCRPC was awarded a $269,000 SS4A Demonstration Grant to fund and pilot the program.

Sober Ride Home will partner with established transportation network companies (TNCs) to offer on-demand transportation services during peak times (Thursday to Saturday), at no cost to the program participant, in a specified service area, targeting individuals who have consumed alcohol. Sober Ride Home will provide users easy access to a ride home, greatly increasing the user personal safety and the overall safety of all community members and transportation system users, while decreasing the occurrence of DUI related crashes and fatalities.

The impaired driving crashes analysis outlined in the Existing Conditions section of this report can guide the development implementation zones, using data to mitigate potential crashes.

Future Meetings of the Safety Working Group

Multidisciplinary and cross-jurisdictional collaboration will continue to be essential to the success of this Safety Action Plan. Bringing together those who have responsibility and expertise in the key areas that have been identified in this plan will ensure proper implementation of countermeasures.

The project team recommends that the Safety Working Group continue to meet on a regular basis to review traffic crash data, equity, transportation system performance, funding, and action plan progress. The Safety Working Group should also discuss at regular meetings if it is appropriate to add representatives from other organizations or jurisdictions as countermeasures are implemented.

Education Countermeasures

Education countermeasures are campaigns, awareness efforts, or events focused on sharing safety information to prevent or mitigate roadway crashes. Given that impaired driving crashes are a priority emphasis area and do not have effective engineering countermeasures, education countermeasures are recommended for these types of crashes.

Pennsylvania has a statewide task force on impaired driving that has developed a comprehensive Strategic Plan to Reduce Impaired Driving. The task force identified several education programs that should be promoted in the Tri-County Region. There are three programs that could be leveraged to provide additional educational countermeasures for the focus areas identified in this study: PA Students Against Destructive Decisions, Community Traffic Safety Projects, and the Bureau of Liquor Control Enforcement underage drinking hotline.

PA STUDENTS AGAINST DESTRUCTIVE DECISIONS

The mission of Students Against Destructive Decisions is to empower young people to successfully confront the risks and pressures that they face, including issues of underage drinking, substance use and abuse, and impaired driving. There are currently over 650 chapters of Students Against Destructive Decisions throughout the state of Pennsylvania.

TCRPC and members of the Safety Working Group should promote and share information about Students Against Destructive Decisions to encourage participation from youth in the Tri-County Region. It may also be appropriate to include representatives from the organization in future Safety Working Group meetings.

COMMUNITY TRAFFIC SAFETY PROJECTS

The Community Traffic Safety Projects are a program that support the State Highway Safety Office by generating earned media, coordinating mobilization, providing police outreach and training, leading educational programs for schools and the general public related to impaired driving, and providing outreach on other safety focus areas.

TCRPC and members of the Safety Working Group should coordinate outreach with the Community Traffic Safety Projects to advertise and promote their activities. It may also be appropriate to include representatives from the Community Traffic Safety Projects in future Safety Working Group meetings.

BUREAU OF LIQUOR CONTROL ENFORCEMENT UNDERAGE DRINKING HOTLINE

In coordination with the Pennsylvania DUI Association, the Bureau of Liquor Control Enforcement administers a hotline to report underage drinking activity. Callers are encouraged to report on planned events involving underage drinkers or parties already underway. By calling 1-888-UNDER21, callers may remain anonymous. As a policy, all information is deemed credible and is investigated by the authorities.

TCRPC and members of the Safety Working Group should promote and share information about the hotline, particularly during times that coincide with major school events like homecoming, prom, and graduation.

Enforcement Countermeasures

Enforcement countermeasures are actions taken by agencies and employees responsible for enforcing laws, maintaining public order, and managing public safety. Similar to the education countermeasures, these enforcement countermeasures are focused on impaired driving crashes. There are two recommendations related to enforcement: using crash data to identify sobriety check locations and completing statewide law enforcement training.

USING CRASH DATA TO IDENTIFY SOBRIETY CHECK LOCATIONS

The "Existing Conditions" section of this plan includes data related to impaired driving crashes near establishments serving alcohol. During discussions with the Safety Working Group, it was noted that this information could be used to determine effective sobriety checkpoint locations for law enforcement. The multidisciplinary Safety Working Group may determine priority enforcement locations based on this previously compiled crash data.

COMPLETING STATEWIDE LAW ENFORCEMENT TRAINING

Providing and conducting roadway safety training for law enforcement officials is critical to achieving the safety goals of this plan. For impaired driving crashes, the most effective strategies are enforcement-based, so providing adequate police training specific to this issue is important. The comprehensive Strategic Plan to Reduce Impaired Driving prepared by the statewide task force outlines specific trainings, including:

- Drug recognition experts to detect motorists impaired by drugs
- Advanced roadside impaired driving enforcement
- Standardized Field Sobriety Test by the National Highway Traffic Safety Administration
- Sobriety checkpoints

The Safety Working Group should monitor the status and number of officers trained across the Tri-County Region as a part of its quarterly meetings.

Technology Countermeasures

Recent advances in vehicle technology have had benefits for driver safety. New features like blind spot detection, collision warnings, and lane departure warning can help drivers avoid vehicle collisions. As technology advances, particularly with vehicle-to-vehicle communication, it will be important for the Safety Working Group to monitor changes to vehicle design and determine if any of the previously presented safety countermeasures should be revised.

Other additional vehicle technology measures have shown great promise in addressing behavior change for crash reduction. Alcohol ignition interlocks, or ignition interlock devices, are breathalyzers that connect to vehicle ignitions. They are designed to prevent drivers from starting their vehicles if they are intoxicated. The National Highway Traffic Safety Administration's (NHTSA's) Countermeasures That Work cites alcohol ignition interlocks as a five-star countermeasure, or one that is "demonstrated to be effective by several high-quality evaluations with consistent results." Pennsylvania law requires that a driver use an ignition interlock for 12 months when they receive a DUI conviction involving a one-year or longer driver license suspension. However, a move to broader, systemic implementation of interlocks may enhance safety.

Source: David Wilson/Wikimedia Commons

IMPLEMENTATION PLAN

There is no one solution to reduce serious injuries and fatalities on Tri-County roadways. It will require thoughtful coordination to realize the recommendations outlined in this Safety Action Plan.

This section outlines progress evaluation processes and performance measures to guide the Safety Working Group as it measures the effectiveness of countermeasures that have been implemented. Recommendations from the Safety Action Plan are also summarized here to indicate prioritization, potential funding sources, and responsible parties.

In all cases, especially when municipalities take the lead on projects, it will be critical for all interested parties (TCRPC, PennDOT, and municipalities) to meet at project initiation to confirm crash history and goals for the project.

Progress Evaluation Processes

Future Safety Working Group meetings should include an update on performance measures. These measures can include both crash data and recommendations data.

PERFORMANCE MEASURES

Recommended data to compile may include:

- Total number of fatal and serious injury crashes on roadways
- Number of total fatal and serious injuries broken down by type:
  - Lane departure
  - Impaired driving
  - Bicycle-involved crashes
  - Pedestrian-involved crashes
- Number of new countermeasures implemented
- Number of countermeasures continued from prior meeting
- Frequency of communication with Safety Working Group members
- Frequency of communication with public and community groups

RECOMMENDATIONS

Countermeasure Type	Countermeasure	Year(s) Implemented	Funding Sources	Responsible Parties
Engineering	Lane departure treatments	Year 1-5 (10 locations per year)	LCSIP, HSIP	PennDOT District 8-0, TCRPC
Engineering	Pedestrian and bicyclist treatments	Year 1-5 (5 locations per year)	HSIP, SS4A implementation grants	Local municipalities
Engineering	High Injury Network road safety audits	Year 1-3 (11 locations year 1, 9 locations year 2, 9 locations year 3)	HSIP, SS4A supplemental planning grants	Local municipalities
Engineering	High Injury Network treatments (following road safety audits)	Year 2-5 (7 locations year 2, 7 locations year 3, 7 locations year 4, 8 locations year 5)	HSIP, SS4A implementation grants	Local municipalities
Engineering	Highway Safety Network screening sites	Year 1-5 (1 location per year)	HSIP	PennDOT District 8-0
Policy & Process	Sober Ride Home pilot program	Year 1	SS4A demonstration grants	TCRPC
Policy & Process	Quarterly Safety Working Group meetings	Year 1-5	N/A	Safety Working Group
Policy & Process	Update Safety Action Plan	Year 5	TCRPC, SS4A supplemental planning grants if funding is still available in Year 5	TCRPC, Safety Working Group
Education	PA Students Against Destructive Decisions	Year 3-5	N/A	PennDOT, Safety Working Group
Education	Community Traffic Safety Projects	Year 3-5	N/A	PennDOT, Safety Working Group
Education	Underage drinking hotline	Year 3-5	N/A	PennDOT, Safety Working Group

Countermeasure Type	Countermeasure	Year(s) Implemented	Funding Sources	Responsible Parties
Enforcement	Using crash data to identify sobriety check locations	Year 4-5	N/A	PennDOT, Law Enforcement
Enforcement	Completing statewide law enforcement training	Year 1-3	N/A	PennDOT, Law Enforcement
Technology	Monitor changes	Year 5	N/A	Safety Working Group

Source: Doug Kerr/Wikimedia Commons

TRI-COUNTY TCRPC REGIONAL PLANNING COMMISSION